tober 1949

Chemical Industries

Including CHEMICAL SPECIALTIES

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PREFERRED

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7728

Vol. 65, No. 4

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This issue is $1.00

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THE READER WRITES

Research Economics

To the Editor of Chemical Industries:

"Research Economics" in your August issue is an excellent article and expresses a viewpoint too often overlooked by research management. On the other hand, if high-risk research is curtailed, the growth of our overall economy will likewise be curtailed and business will be abdicating to Government its historical function of new enterprise. We've got to avoid doing so, in my opinion.

GEORGE L. PARKHURST
San Francisco, Calif.

To the Editor of Chemical Industries:

I was glad to have the opportunity of reading Dr. Soule's article on research economics. In my forthcoming book on the organization of industrial and scientific research, I have devoted some attention to the amount which a company can afford to spend on research, and have pointed out that the chief factor by which research expenditure can be determined is the capital cost involved in the placing of new products on the market. I have, however, assumed a considerably higher cost for the development of research products for the market than that assumed by Dr. Soule. In the example given by him at the bottom of page 286, he reports a total research cost of $250,000, development costs (including pilot plant) $150,000, and plant and equipment costs $1,000,000.

On the average I feel that the cost of development and plant is much higher than that which Dr. Soule indicates as compared with the cost of research, and I have more or less arbitrarily assumed that the research cost is only 10 per cent of the total cost, development and pilot plant 25 per cent, and plant and equipment cost 65 per cent. These figures have been stated in various discussions of the subject, and accord fairly well with my own experience and that of other research directors whose opinions I have obtained.

Dr. Soule's analyses of the effect of the present economic conditions, and especially the price of common stocks, upon the direction of research are very interesting and valuable. The high cost of capital has already had some effect upon the direction in which our research is being planned, and has particularly led—as Dr. Soule points out—to our stressing research work leading to the reduction of manufacturing costs.

C. E. K. MEES
Eastman Kodak Co.
Rochester, N. Y.

To the Editor of Chemical Industries:

Dr. Soule's analysis of research economics in your August issue is indeed thoughtful and thought-provoking. I am wondering, however, why he singles out research. The same factors, economic and financial, which Dr. Soule uses could, in theory, be applied to any phase of the enterprise system. It could just as readily be applied to advertising shall we say, or to replacement of old machinery and equipment by better types of machinery costing more money, and I fear that if we were to put the same type of economic microscope on those phases of business as well as research, we might come up with a similar hypothesis to that evolved by Dr. Soule and the end result would be a complete stifling of the enterprise system.

The big question to be answered, of course, both by an individual investor and by a giant corporation, is whether it is better to find the means of financing these insurance policies dedicated to betterments in the future through the various means available under the enterprise system, be they from retained earnings, from new venture capital or from the bond market, or whether to stand to one side and milk the funds from past insurance policies dry.

I feel very greatly that if a large number of important American industrial corporations, which, of course, includes their stockholders, were to pursue the latter policy, we would be playing directly into the hands of those elements in our country who look forward to the "Welfare State" administered from a central government.

The world is dedicated to progress, and I have not even approached that state of mind yet where I believe that such progress as research affords us can best be obtained through the "Welfare State."

By present accounting methods and by recognition of the Internal Revenue Bureau for tax purposes, current research expenditures are considered an item of cost or expense. As long as that practice maintains, the successes of the past should continue to be the powerful, impelling force to encourage continued expenditures for this purpose. No one can tell at the time research money is spent whether or not the end product of such research will yield any particular percentage of return on the investment. We are sure, however, that our high standard of living would not maintain unless a sensible proportion of the sales dollar in the way of cost or expense is spent for this very useful purpose.

WILLIAM S. RICHARDSON, President
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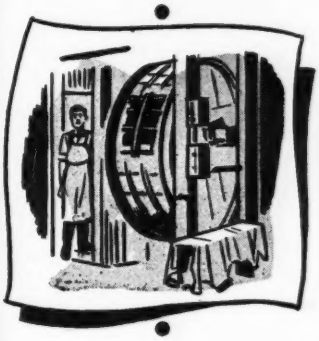

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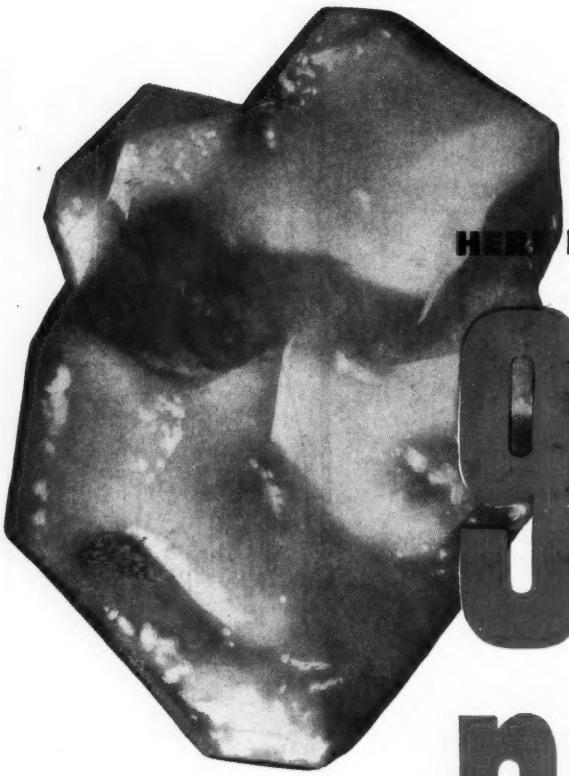

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Please mention your proposed application.

***TYPICAL ANALYSIS ON A DRY BASIS**

99.71	SiO_2
.03	Fe_2O_3
.10	Al_2O_3
.09	TiO_2
.01	CaO
.02	Na_2O
.01	ZrO_2
.03	Trace Elements

THE DAVISON CHEMICAL CORPORATION

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BALTIMORE-3, MD.

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$CH_2=CH-CH_2OH$

...in tank cars and drums

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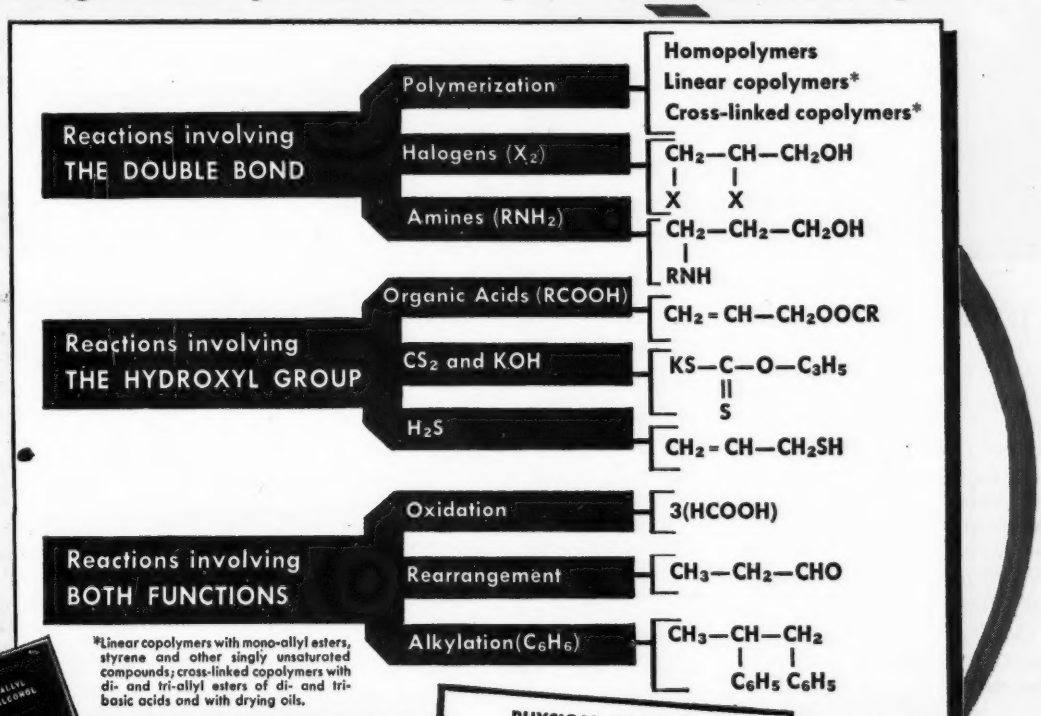

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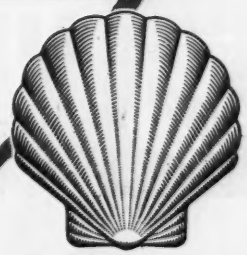
Flash Point, Tag open cup	90°F
Tag closed cup	72°F



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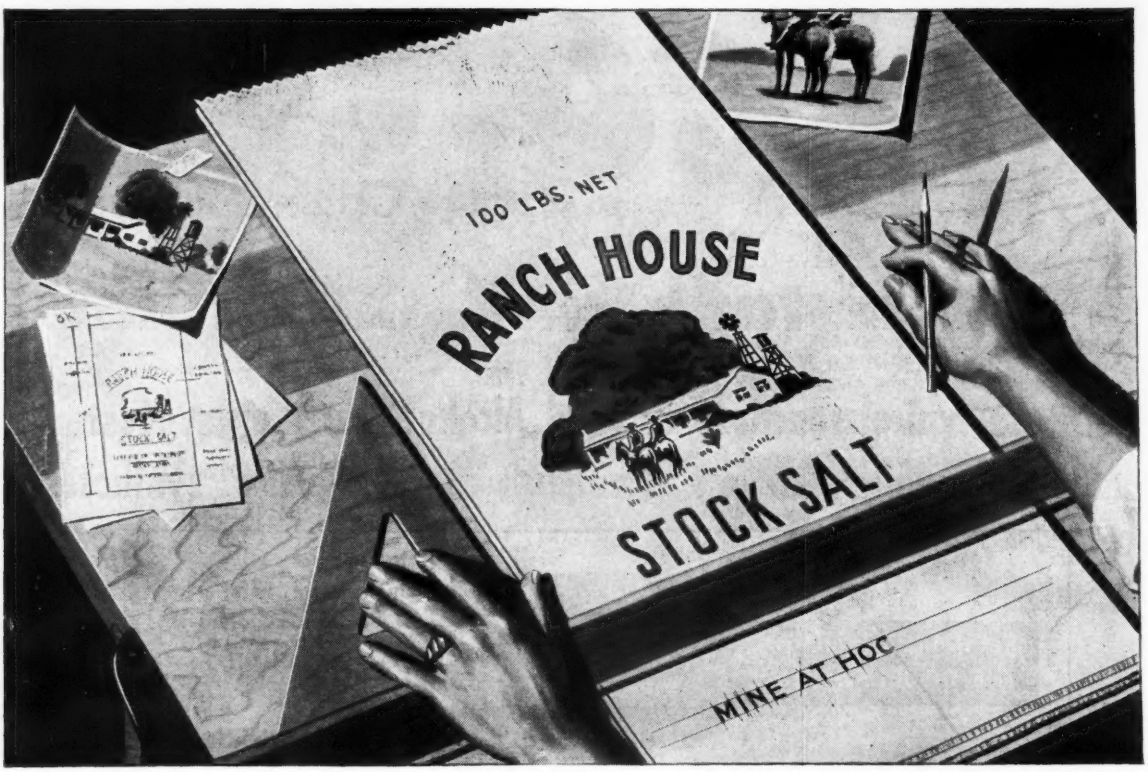

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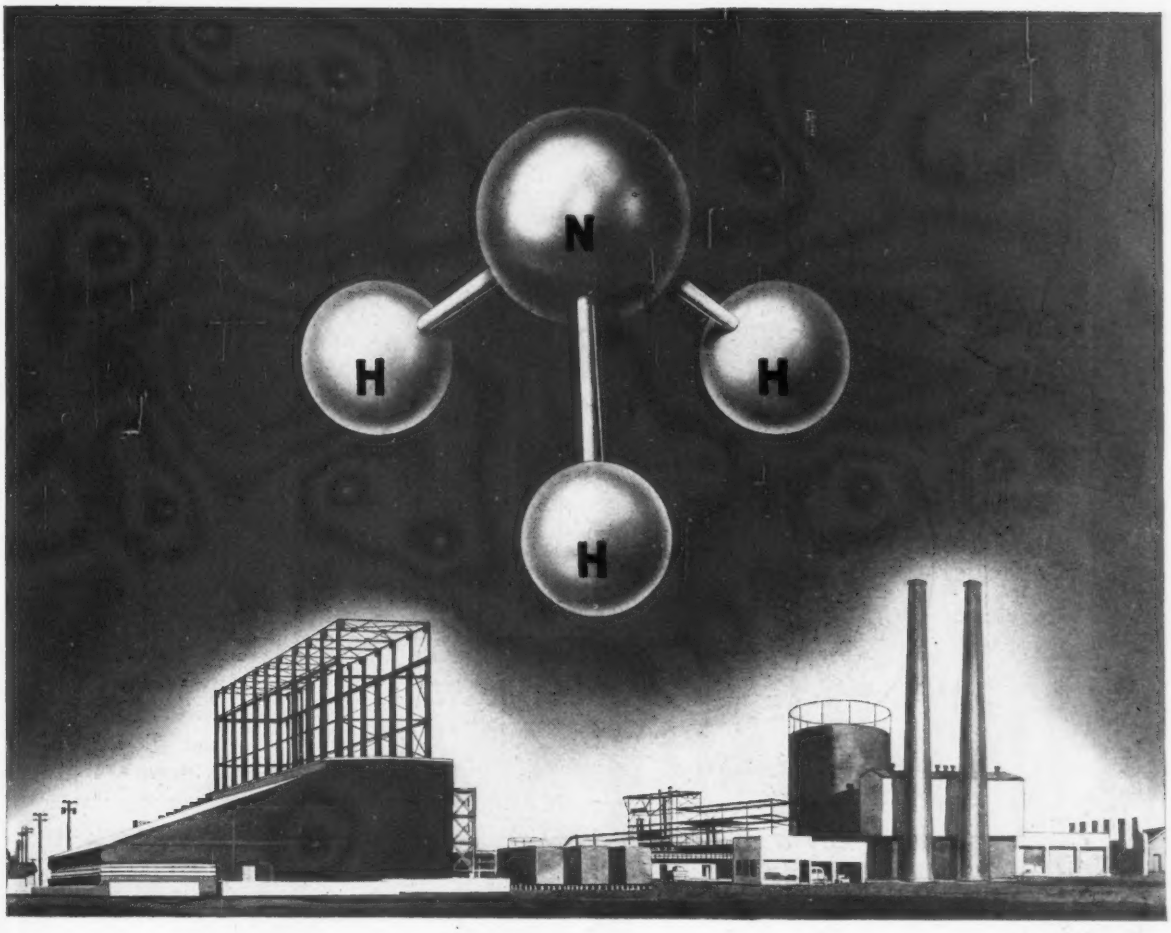

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Typical Analysis

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Mean Molecular Weight	145.7
Titer	13.0°C.
Iodine Value (Wijs)	0.8
Neutralization Value	385.0
Color....Water White Odor....Characteristic	

Typical Composition

Caprylic Acid	90.0%
Caproic Acid	3.0%
Capric Acid	7.0%

Neo-Fat 9 (Capric Acid)

Mean Molecular Weight	173.3
Titer	30.0°C.
Iodine Value (Wijs)	1.2
Neutralization Value	323.7
Color.....White Odor.....Characteristic	

Typical Composition

Capric Acid	90.0%
Lauric Acid	7.0%
Caprylic Acid	3.0%

Neo-Fat 11 (Lauric Acid)

Mean Molecular Weight	203.0
Titer	37.8°C.
Iodine Value (Wijs)	1.0
Neutralization Value	276.0
Color.....White Odor.....Trace	

Typical Composition

Lauric Acid	90.0%
Myristic Acid	9.0%
Unsaturated Acids	1.0%
Capric Acid	trace

Neo-Fat 13 (Myristic Acid)

Mean Molecular Weight	226.0
Titer	37.8°C.
Iodine Value (Wijs)	2.0
Neutralization Value	248.0
Color.....White Odor.....Characteristic	

Typical Composition

Myristic Acid	90.0%
Lauric Acid	4.0%
Palmitic Acid	4.0%
Unsaturated Acids	2.0%

Neo-Fat 1-56 (Palmitic Acid)

Mean Molecular Weight	258.0
Titer	56.0°C.
Iodine Value (Wijs)	3.0
Neutralization Value	216.0
Color.....White Odor.....Trace	

Typical Composition

Palmitic Acid	90.0%
Oleic Acid	4.0%
Stearic Acid	6.0%

Neo-Fat 1-65 (Stearic Acid)

Mean Molecular Weight	282.5
Titer	67.0°C.
Iodine Value (Wijs)	3.0
Neutralization Value	198.0
Color.....White Odor.....Trace	

Typical Composition

Stearic Acid	90.0%
Palmitic Acid	6.0%
Oleic Acid	4.0%

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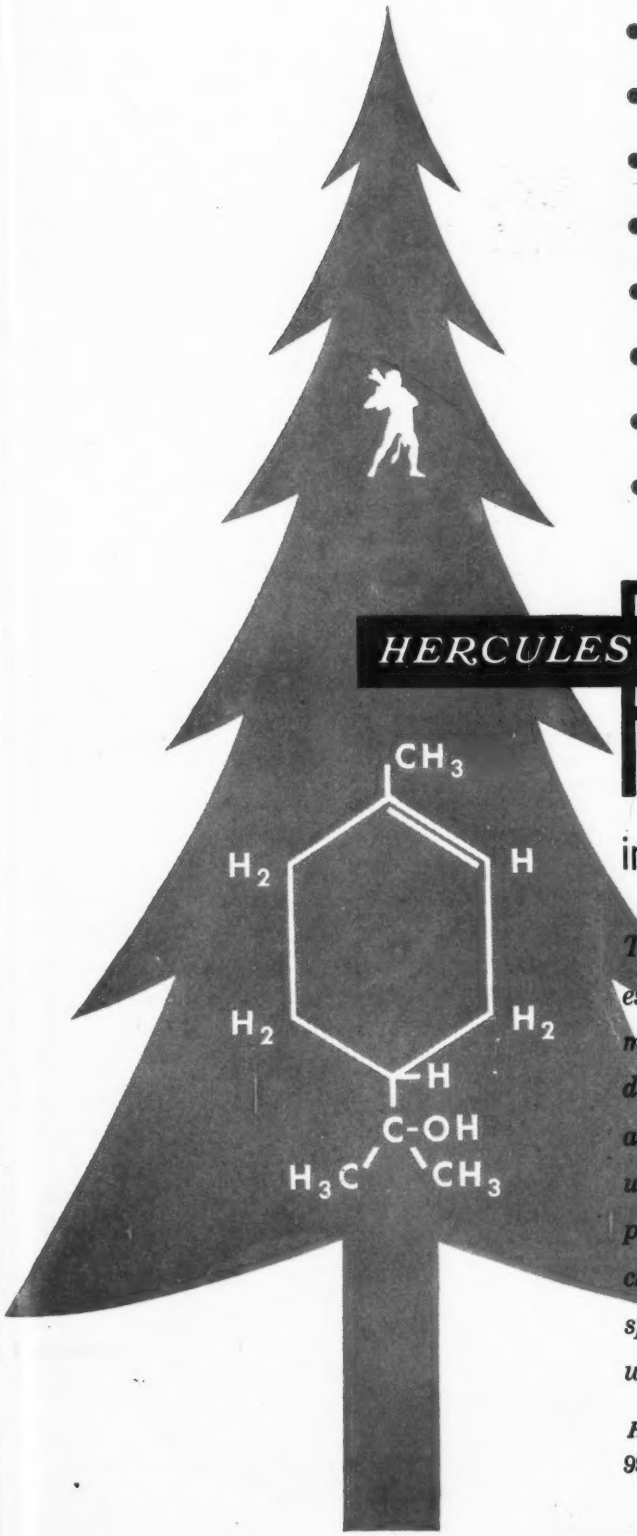
This literature and other technical information is free upon request. On your business letterhead please address, The Armour Chemical Division, 1355 W. 31st Street, Chicago 9, Illinois.



- *penetrate*
- *wet*
- *disperse*
- *dissolve*
- *disinfect*
- *deodorize*
- *preserve*
- *degrease*

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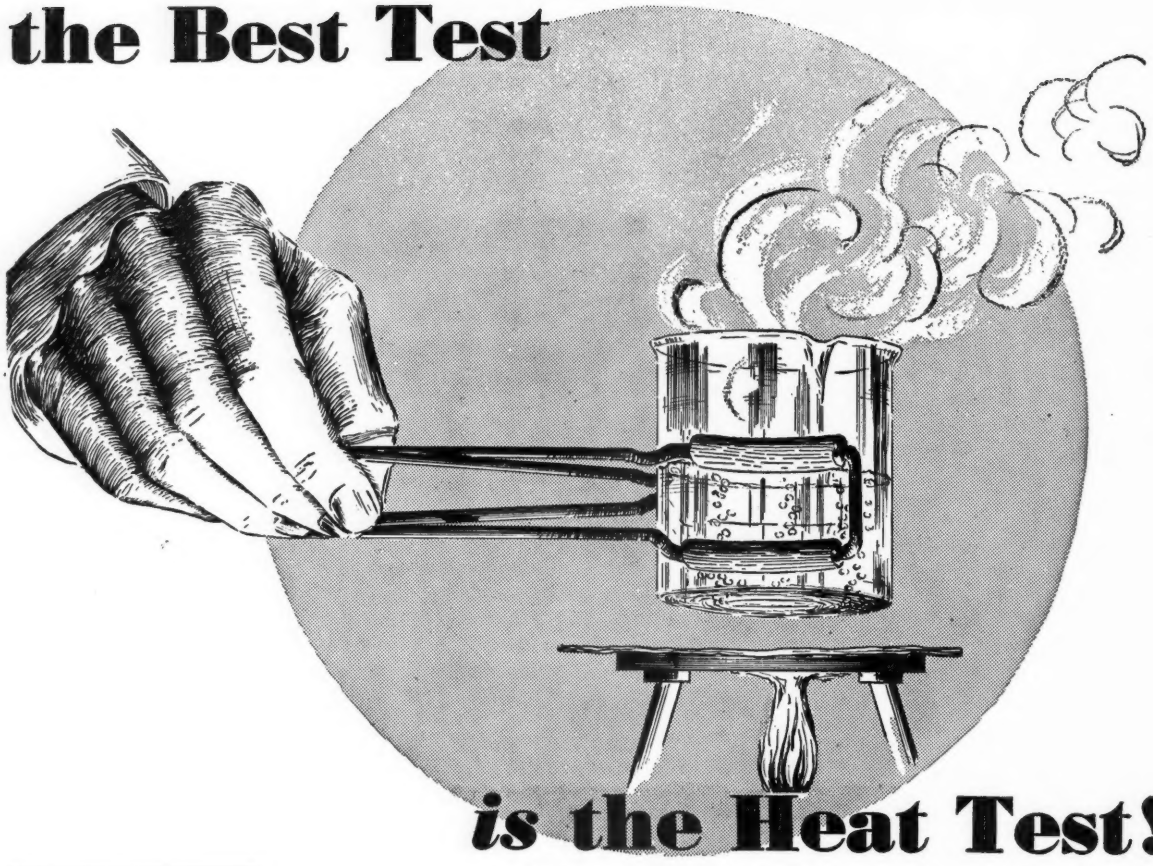

is the Heat Test!

A. GROSS PRODUCTS

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Red-Oil (Oleic)
White Oleine
Coconut Fatty Acids
Cottonseed Fatty Acids
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Stearine Pitch
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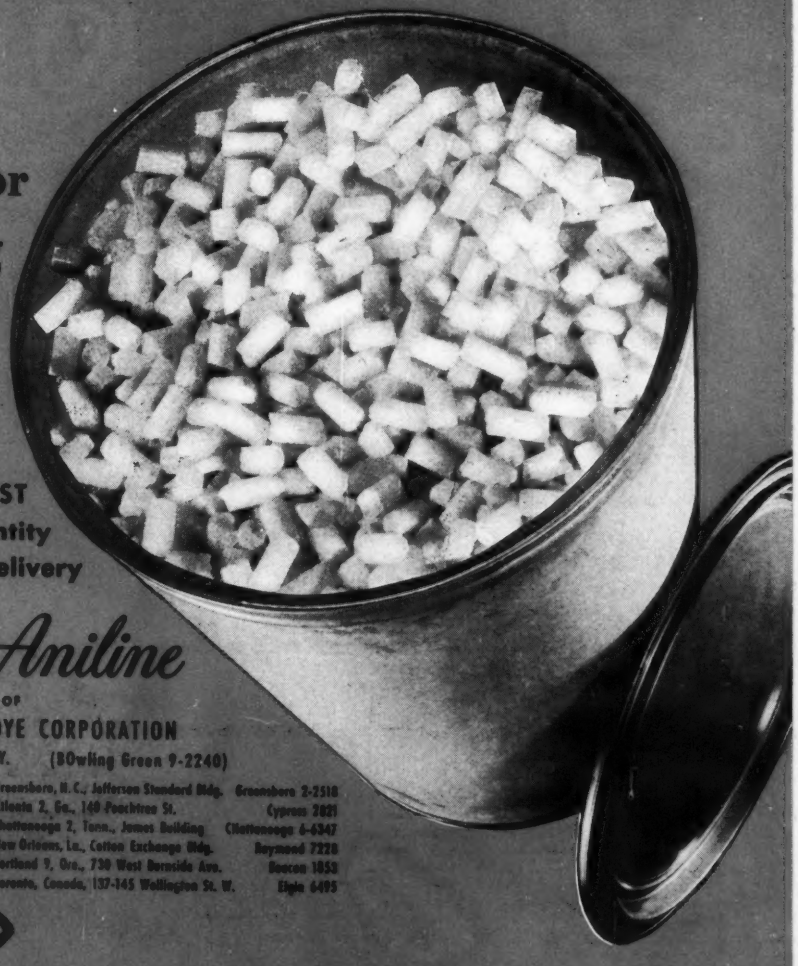

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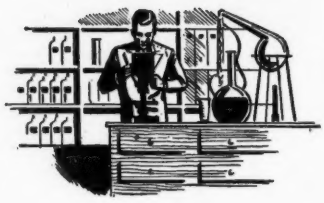

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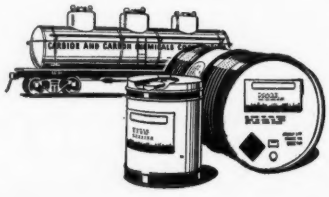

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Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

Newsletter,
October, 1949

For Your Information:

Latest to join the growing chemical tanker fleet is Carbide & Carbon Chemicals Corp.'s 15,000-ton converted T-2, which will bring chemicals from company's Texas City, Tex. plant to Carteret, N. J. Ship is specially fitted with seven 300,000-gal. and three 100,000-gal. tanks for chemicals, eighteen smaller wing tanks for petroleum. Chemicals to be carried include methanol, acetone, n-butyl alchol, ethyl and butyl acetate, ethylene glycol.

Carbide's boat is slightly larger than the Dow vessel mentioned last month. Latter will carry 50% caustic soda, ethylene and propylene glycols, carbon tetrachloride, ethylene dichloride and other chlorinated solvents in nine cargo tanks; flaked caustic and other drummed chemicals in a dry hold.

Boyce Motor Lines, Inc., owner of carbon-disulfide-laden truck that exploded and burned in the Holland Tunnel May 13 was indicted on six counts this month by a Federal grand jury in Newark, N. J. If convicted on each, carrier faces maximum fine of $15,000. Specific charge: "...knowingly sending improperly marked explosive-carrying vehicles through the tunnel..."

* * CI * *

Storage of natural gas on fuller's earth (CI, July 1949, p. 37) is now in pilot plant at Warren, Pa. Operation is by J. F. Pritchard & Co., Kansas City engineering firm, and Floridin Co., Warren. Principal claim over other methods of gas storage is greater safety. Pilot plant tests on adapting the operation's adsorption-desorption cycle to tonnage oxygen production are planned.

Ethylene glycol production on the West Coast may become a reality. Hancock Oil Co. is actively considering a plant at Long Beach, Calif.

* * CI * *

Pittsburg Coke and Chemical Co. will announce production of phthalate ester plasticizers, e.g., dioctyl phthalate, in early 1950.

Now being test marketed are three new surface active agents; a liquid organic salt of an alkyl aryl sulfonic acid, made by Atlantic Refining Co. for eventual consumer distribution; two new polyethylene oxide derivatives (Tergitols TMN-650 and NPG-10) by Carbide & Carbon Chemicals Corp. This is a departure for Carbide, which previously has been a major supplier of ethylene oxide but has not made the detergents themselves.

More Carbide news: Company becomes first commercial-scale producer of acrolein (CI, Sept. 1949, p. 340) with start-up this month of a plant at Institute, W. Va. It is also prepared to make certain acrolein derivatives, such as allylidene diacetate (CI, Oct. 1949, p. 499), ethoxy propionic acid, and methyl mercapto propionaldehyde.

* * CI * *

Reichhold Chemicals, Inc. has concluded a financial arrangement with Diamond Alkali Co. to provide funds for extensive modification and improvement of Reichhold's phenol plant at Tuscaloosa, Ala. Physical assets and operation of the plant will be transferred to a new Alabama corporation, of which Diamond has an option to purchase half. Both concerns will point research toward new products and processes in the field of phenol and derivatives. Deal holds added advantage for Diamond: a large assured market for some of its excess caustic soda production.

Wm. S. Merrell Co., ethical drug subsidiary of Vick Chemical Co., has started manufacturing operations in a new plant at Toronto, Ont. This is first manufacturing Merrell has done in Canada, although it has maintained small packaging and storage facilities at the Toronto location.

Metalloy Corp. will soon introduce lithium ribbon and petrolatum-coated lithium wire to supplement its lump, shot, sand, rod and regular wire forms of the metal. The ribbon offers greater surface area for chemical reactions.

Monsanto Chemical Co. is offering vinyl chloride film in limited quantities, expects to get into large-scale production shortly. (Look for announcement of another new vinyl product by Monsanto within a month or so.)

Recently-formed Monsanto-American Viscose subsidiary for synthetic fiber development, Chemstrand Corp. (CI, June 1949, p. 918), has several experimental fibers in pilot plant, is in process of narrowing down the field for intensive development of one or two.

Gillette Committee is definitely planning an investigation and hearing on "DDT poisoning" in 1950, according to a member of that committee.

Recent reduction in mandatory minimum of GR-S in U. S. rubber goods from 33% to 25% will not shut down any GR-S plants, but one butyl plant may close. However, unless more natural rubber is produced, the 25% minimum will not be reached.

* * CI * *

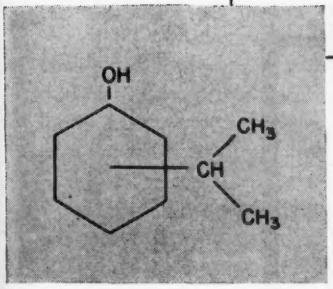
Here and There:

Dow Chemical Co. will buy 250 acres of land on the Ohio River in vicinity of Ironton, Ohio, as a "stand-by site for possible future chemical production" . . . Cowles Chemical Co. will shortly consolidate its research and development in expanded quarters at Syracuse, N. Y. This will enable company to centralize formerly scattered activities. . . . Swiss Patents 233,176 and 239,538 describe new method for making vinyl compounds and ketene: from acetates over a dehydrating catalyst.

The Editors

KOPPERS NOW OFFERS

New intermediates for the chemical industry



ISOPROPYL PHENOLS

Isopropyl Phenols—long in the laboratory stage—are now being produced for the first time in commercial quantities by Koppers.

Production of the Isopropyl Phenols has been made possible by Koppers continuing research on derivatives of the coal chemicals. Many useful applications are already indicated.

Promising uses include the production of phenolic-type resins, lubricating oil additives, engine-cleaning compounds, plasticizers, rubber-processing chemicals and agricultural chemicals, and use as a solvent for wire-coating enamels.

The chemical reactivity and the physical properties of the Isopropyl Phenols are similar to those of the cresols and the lower alkylated phenols. Properties of typical samples are shown below:

	ortho-Isopropyl Phenol	meta, para-Isopropyl Phenol
Boiling Range, 5-95%	**206-213°C**	**221-228°C**
Specific Gravity, 30°C	**0.987**	**0.983**
Refractive Index, n_D^{20}	**1.528**	**1.526**
Solubility in 10% NaOH	**Complete**	**Complete**

Commercial quantities of both ortho-Isopropyl Phenol and meta, para-Isopropyl Phenol are now available; Diisopropyl Phenol is available from pilot plant operations.

Samples of each grade of Koppers Isopropyl Phenols are now available to research and development chemists.

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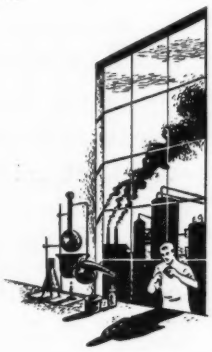
JERSEY CITY, NEW JERSEY

NEW CHEMICALS AND NEW EQUIPMENT, 1949

by ***ROBERT L. TAYLOR, Editor***

ANYONE WHO FOLLOWS STATISTICS, price trends, and other business barometers knows that the chemical salesman's lush days have gone the way of the ration book and the allocation order. Four years ago production was in the driver's seat while research lagged behind. Last year they were both going full tilt, and now the laboratory has outpaced the plant.

While the steam has been down and the night shift furloughed in the plant, lights have been burning in the laboratory as chemists have developed new products to attract the once-eager, now-apathetic customer. Proof: CI's advertisers have submitted descriptions (page 579, this issue) of well over 500 new chemicals and specialties introduced during the past year—more than have been listed in any previous year.



A FURTHER SERIOUS PRODUCTION DROP could, by sheer necessity of retrenchment, stem the flow of new products from the research and development departments. But chemical men generally think that consumption has hit bottom and most are confident that the present rising curve will continue.

Even so, conditions will not return—assuming that the cold war doesn't get warmer—to the easy days of '46. While the general industrial level is high by prewar standards, manufacturers will have to battle it out for the consumer's dollar; and the best product—not simply any product—will win. While there is always room for the high-cost, special-purpose innovation, more than ever the emphasis is on cost-cutting. The material that will cut the consumer's production costs without sacrificing quality will have the advantage.

Thus this Fifth New Chemicals and New Equipment issue, we believe, carries greater significance for Chemical Industries readers than any of its predecessors. It is the purpose of this annual survey to bring together in one place the year's new tools—in the form of new chemicals and raw materials, new equipment, and new packages—that will help process industries plants reduce operating costs and turn out better products. The year has been a banner one for new ideas in almost every category.

AMONG THE NEW EQUIPMENT LISTINGS and the New Chemicals for Industry, the alert reader is almost bound to find a new raw material, processing agent, or piece of equipment that offers possibilities of savings or product improvement in his own plant. In addition the review articles, written by experts in their respective fields, open a sight-glass into how some users are already taking advantage of many of these new things.

In the field of chemicals, price decreases in certain basic materials and intermediates have heightened activity in development of derivatives. A number of the new compounds introduced during the year can be made at attractive prices if quantity consumption can be developed.

Equipment manufacturers, attuned for a year or more to customer's tendencies to take a second look at the price tag, are coming forth with "economy" models. A few, by combining new ideas with cost-conscious redesigning, have produced some surprising results.

Packaging continues to be a field for savings which many of the process industries appear not to have exploited fully. The trend toward mechanization, with its attendant effect on package design, has been particularly noticeable during the year.

THESE AND OTHER MAJOR TRENDS, as well as specific developments in materials and equipment, are described and discussed in the pages that follow. If from them process industries readers derive information that will strengthen their own operations, and through them the industry of the country, the large amount of time and effort expended by the authors and editors in preparing this issue will have been worth while.

The extremely reactive maleates open new fields for investigation in the manufacture of

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Water-white liquids, miscible with most organic solvents, the three maleates incorporate ester groups which offer real advantages over maleic anhydrides in many applications. Liquids at ordinary temperatures, they can easily be handled in a closed system. Our Technical Service Division is on call to help you apply these useful compounds to your products or processes. For free samples and further information, write, wire, or phone today!

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	DIMETHYL MALEATE	DIETHYL MALEATE	DIBUTYL MALEATE
Formula:	$(-CHCO_2CH_3)_2$	$(-CHCO_2C_2H_5)_2$	$(-CHCO_2C_4H_9)_2$
Molecular weight (calc):	144.12	172.18	228.28
Density, g/ml, at 25°C:	1.1462	1.0637	0.9907
Weight per U. S. gal. at 25°C:	9.56	8.88	8.27
Coefficient of Expansion, 20°C to 30°C, per 1°C:	0.00089	0.00094	0.00088
per 1°F:	0.00049	0.00052	0.00049
Refractive Index, n_D at 25°C:	1.4405	1.4383	1.4435
Boiling Point, °C at 760 mm of mercury:	200.4	225.3	d
220 mm of mercury:	157.0	177.7	224.9
10 mm of mercury:	84.0	99.4	138.7
Heat of Vaporization, kcal/mole:	12.2	12.5	....
Melting Point, °C:	–17.5	–11.5 (approx.)	....
Viscosity, centipoises; at 25°C:	3.21	3.14	4.76
Flash Point, Cleveland Open Cup:	235°F	250°F	285°F
Surface Tension, dynes/cm, at 25°C:	41.2	36.7	28.7
Solubility, M1 H_2O in 100 ml product:	5.0	2.1	<0.05
M1 product in 100 ml H_2O:	7.0	1.3	<0.05

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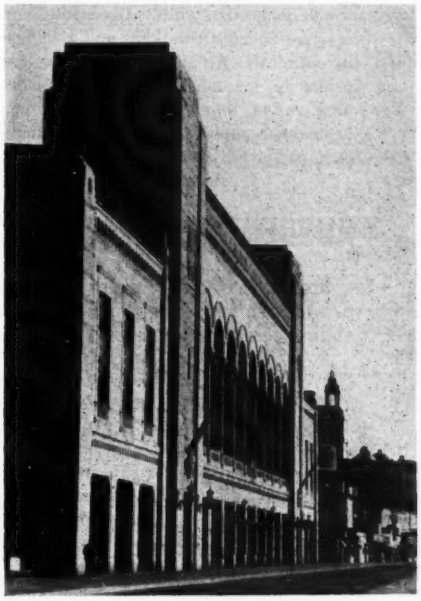
What's new



CHEMISTS GATHER ON BOARDWALK

American Chemical Society members at 116th National Meeting hear all-time record number of papers.

IN THIS year of industrial belt-tightening, considerably fewer than the expected 10,000 chemists hied themselves to Atlantic City for the annual Fall meeting of the American Chemical Society.

The 8,000 that did come, however, were treated to a record number of 1,065 papers, a record number of awards, a week of marvelous weather, and a couple of bold proposals.

The boldest was made by ACS President Pauling, who advocated that funds made available by the National Science Foundation, when it is established, be supplemented—to avoid a preponderance of Federal money and its inevitable bureaucratic power—by a $75 million-a-year fund from industry to support basic research. Using a familiar argument, he cited last year's $20 billion corporate profits, concluded that industry wouldn't miss the research kitty. He made one telling point that may, and should, give industry pause: Industry, in its applied research, has been reaping where others have sown; it has been picking the apples off the tree of knowledge and hasn't paid much attention to those "pure scientists", in colleges and universities for the most part, who have planted the tree.

Literature Support

A similar but more modest proposal was made by Arthur B. Lamb, retiring editor of the *Journal of the American Chemical Society*. Citing the growth in the number of articles submitted for publication, rising publication costs, and the necessity of wide dissemination of scientific knowledge, he called upon industry to help underwrite scientific publication.

As usual, chemists came to the convention to see other chemists as much as to hear papers. More chemistry was discussed by little knots of registrants on the boardwalk, in hotel lobbies, rooms and bars, more likely, than in the meeting rooms.

This is not to say that the technical sessions were neglected: Even on Friday morning, by which time most convention-goers had left, the Rubber Division's meeting room was filled to capacity. In all of the divisional meetings the trend towards more and more symposia—variations on a single theme—seemed evident. This made up in part for the rather sketchy and preliminary nature of many of the papers—a circumstance that is probably inevitable in view of the quantity.

WAXED PIPE

Protective wax coating for cement-asbestos pipe broadens applications.

LISTENERS at the sessions of the Division of Water, Sewage, and Sanitation Chemistry at the American Chemical Society annual meeting last month heard J. F. Wilkes, Dearborn Chemical Co., describe "a quick and dirty research problem" involving concrete-asbestos pipe.

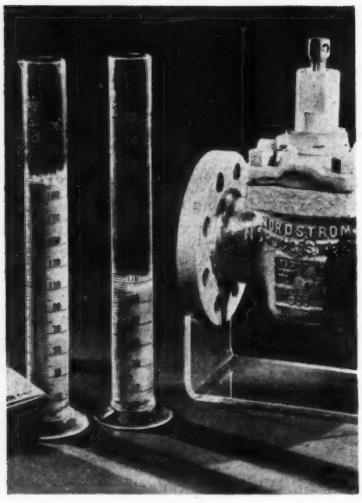
During the war, when steel and cast-iron pipe were hard to get, many boiler users—especially the railroads—started employing cement-asbestos (Transite) pipe. Since then many have continued to use it because of its lightness and strength.

But where high-purity water is involved, such pipe runs into difficulties: The purer the water, the greater the leaching out of silica and ionized, scale-forming salts from the pipe. (That's a logical consequence of the law of mass action.)

Dearborn Chemical Co. had ten days to solve this problem for a 4" underground pipe. Fortunately, the company had had experience with wax-type coatings on concrete, so it didn't have to start from scratch. Quick tests showed that a petroleum-type wax melting at 180° F. and applied at 275° F. cut the ionized salt content of the water in contact with the pipe from 75 ppm in one hour to 3 ppm in 300 hours.

But then came problem number two: The wax coating made the joints too slippery for good assembly. This was solved by coating the joints with a black-pigmented vinyl copolymer and masking them with kraft paper and tape before dipping the pipe in a trough of molten wax. The coated pipe has been in the ground for two years now and has given completely satisfactory service.

While the primary purpose of this application was to keep the pipe from ruining the water, the coating is equally effective in keeping water from ruining pipes (either concrete, steel, or cast iron) or concrete foundations.



HYPERMATIC (left): Almost twice as much as ordinary lubricant (center) can be forced into valve at right.

COMPRESSIBLE GREASE

New plug valve grease is 50% compressible, stores own energy for automatic lubrication.

A GREASE which in effect overcomes the principle of incompressibility of liquids has been developed for use as a self-feeding plug valve lubricant by the Nordstrom Valve Division of Rockwell Manufacturing Co., Oakland, Calif.

The new grease, which is compressible to about 50% of its atmospheric volume at 300 to 500 p.s.i., is said to be stable at temperatures up to 300° F. and for periods of time of at least two years. When pressure on the grease is released it will return to its original volume.

The company has not divulged the nature of the material, but lubricant experts' best guess is that it is a "superstabilized" gas-liquid emulsion, with the gas providing the property of compressibility. Whatever it is, Rockwell has turned a neat trick in achieving something that has tickled the fancies of research scientists for years.

Two Decades

Credit for the development goes to George F. Scherer, for the past 22 years chief research engineer of the Nordstrom laboratory. Ever since he went to work on valve lubricants two decades ago, Scherer has dreamed of compounding a material that would make valve lubrication automatic and thereby eliminate the one basic objection to lubricated valves: the necessity for frequent re-lubrication.

Called Hypermatic, the new grease is self-feeding by virtue of the energy stored in it while it is under pressure in the lubricant reservoir of the valve. Sufficient Hypermatic is injected into the reservoir to bring the pressure to a point approximately 50% above the rated working pressure of the valve. Only when this pressure falls below 200 p.s.i. on very high pressure services, or 50 p.s.i. on low pressure services, is it necessary to add more lubricant. Automatic lubrication may be restored simply by adding more Hypermatic either by insertion of the material in stick form or by a high pressure grease gun.

50% Saving

Under these conditions Hypermatic will continue to exert sufficient pressure to fill lubrication voids in the valve for from 10 to 100 times as long as noncompressible lubricants. This, Scherer, believes, will mean an average saving of 50% in man-hours of line service.

The lubricant is said to require no changes in valve design. It is held in its "energized" condition between the valve sealing surfaces and the ball check valve in the stem at the top of the lubricant chamber.

Actually, it is not absolutely necessary that Hypermatic be compressed to a higher pressure than the line pressure in order to feed automatically. The reason for this, according to Scherer, is that if a leak of line fluid were to develop inside the valve, there would be sufficient pressure drop along the path of the leak to permit sealing off by the lubricant at relatively low pressure. For the same reason, but in the reverse direction, there is no danger of leakage of Hypermatic into the line.

GEORGE SCHERER: With Hypermatic (right), no leak.

Hypermatic is said to be suitable for use in connection with hydrocarbons, nonreactive aqueous solutions, and a number of chemicals. Although it was developed primarily for lubrication of pressurized plug valves, indications are that it may have other applications, both as a lubricant and as a hydraulic shock absorber.

RUBBER AND WATER

Styrene-butadiene water-emulsion paints have long shelf life, high washability, resistance to alkali.

DOW CHEMICAL CO.'s participation in the synthetic rubber program set heads —particularly the head of L. L. Ryden— to thinking about the use of rubber binders in water-emulsion paints.

The first outcome of that project was a pigment binder for coated papers, and at the ACS meeting Dow chemists revealed the commercial success of water-base paints incorporating rubber rather than resin as a film-forming component.

Dow sells the styrene-butadiene copolymer latices to paint manufacturers— which ones Dow is not at liberty to say —as 45% stabilized water emulsions, the solid particles of which average 0.3 microns. A typical interior flat formulation consists of

30	parts	China clay
10		titanium dioxide } pigment
60		lithopone
35		4% 100 cps. Methocel
4		10% Dowicide G
1.2		alcoholic ethanolamine oleate
20		X-512 latex solids (i.e., 44.5 parts of 45% emulsion)
0.33		pine oil
1		tributyl phosphate
1		Tergitol 7

Other formulations, of course, are possible, the most important limitation being that the pigment does not contain soluble salts that might break the emulsion. Even that limitation can often be overcome by the addition of polyphosphate sequestering agents.

The formulation above contains 20 parts of latex solids per 100 parts of pigment. Dow learned that the ratio is important: 12, 15, and 18 parts give respective washability values of 850, 3300, and 9500. Washability is, in fact, one of the paint's outstanding characteristics. It gave a value of 13,000 strokes in a wash test as against 900 for an oil-emulsion paint.

Formulations for interior flats and sealers are entirely successful. Exterior

paints are still in the process of development, for the ones formulated to date show poor shelf life.

Dow expects that its new paint base will be particularly useful on stucco, plaster, and cement-type surfaces where the alkalinity of the surface attacks hydrolyzable materials such as synthetic resins and natural oils.

FIRE FOE

Flame-retardant treatment for cotton and rayon based on titanium and antimony complex.

HANDSOME George Seidel, a Du Pont research chemist, stole the show at the American Chemical Society symposium on flame retarding of textiles with a carnival-like demonstration. Disdaining for the occasion the many technical tests for flame-retardancy that were discussed, he held a lowly match to two strips of cloth. One went up in a brilliant blaze that awakened even the slide projector operator; the other, previously treated with Du Pont's new flame-retardant, was undamaged.

The new process described in a paper by Seidel and Hugh C. Gulledge of the Pigments Department of E. I. du Pont de Nemours and Co., Newport, Del., is expected to arouse as much interest in the textile field as it did at Atlantic City. An annual market estimated at 100 million pounds of fabrics, mostly cotton and rayon, awaits an effective yet inexpensive flame-retarding process, according to American Cyanamid Co.'s Kenneth H. Barnard.

Greatest demand is for treating lace and other curtains, chenille robes, brushed napped and pile fabrics, upholstery fabrics, some work clothing and sheer goods. Since cotton or rayon treated with Erifon, as the new flame retardant is called, will withstand home laundering and dry cleaning, Du Pont will be shooting for some of this business. In addition, there are outdoor applications, such as flame-retarding of tents and awnings, which call for a durable treatment.

Titanium and Antimony

Erifon is an outgrowth of Du Pont's fundamental research on titanium, which the company recently began producing on a small commercial scale. Titanyl sulfate ($TiOSO_4$) was found to react readily with gel cellophane with the maximum amount of titanium that could be combined corresponding almost exactly with 3 mols of titanium per glucose unit (the number of alcoholic hydroxyl groups on such a unit). This compound also had a swelling effect on cellulose that varied in proportion to the concentration of the titanyl ion. Other titanium salts were tested, and titanyl chloride ($TiOCl_2$) was found to be the best swelling agent and one that reacted most easily with cellulose.

Cotton cloth treated with titanium salts burned less readily than untreated fabric, but the degree of flame resistance was impractical. This effect, however, did suggest that a durable flame-resisting treatment might be developed since these salts seemed to combine with the cellulose molecules in the fabric.

Trying out combinations of titanium salts with other metallic salts revealed that an antimony trichloride and titanyl chloride complex was the most effective in providing flame retardancy. This was surprising as antimony oxide alone is quite ineffective and completely removed by one household laundering. Although the Du Pont researchers have not yet proven the structure of Erifon-treated fabric, they feel that the titanium forms a chelate ring with the cellulose while its primary valance hangs onto the antimony. There is much indirect evidence to support this explanation, but as yet no direct proof.

GEORGE SEIDEL: Listeners took notice.

Many flame-retarded fabrics when tested with a flame will exhibit a burned spot at the point of contact which glows but does not spread any further. This phenomenon known as afterglow may be experienced with fabrics that can pass required standards for fire-retardancy, yet the consumer may distrust the treatment since he expects no burning by any mechanism—whether fast or slow. With Erifon-treated fabrics, afterglow is controlled by using SiO_2 in the form of sodium silicate padded on the fabric and precipitated by application of the acidic titanyl chloride-antimony chloride complex.

Application

Cotton or rayon can be treated in any mill by a two-step process. The material is impregnated by a padder which must be rubber-lined and have rubber-covered rollers (Erifon solution has excess HCl). Too, the padder must have hydraulic pressure to aid impregnation and to obtain low wet pickup for economy's sake. Wetting agent can be employed in this step. Following impregnation, some arrangement such as a "J" box is used to allow no more than a 15-minute lag in which the solution diffuses into the fabric. Then the material is run into a neutralization tank where it must be rapidly and completely neutralized with alkali such as 15% Na_2CO_3 to prevent leeching of Erifon into the solution, and the formation of hydrous oxides which can cause chalkiness. Washing with soap, synthetic detergent, or even a little alkali completes the operation.

The treatment has already been applied on a plant scale to many types of cellulose fabrics, but special problems have to be worked out with individual mills. Some dyes won't work on the treated fabric, but this has not been a stumbling block and solutions have been found for each problem. In general, dyes fade more rapidly on treated cloth than on untreated. Here again, selection of suitable dyes have circumvented difficulties.

Properties

Tensile strength of fabric is not reduced either initially after treatment or upon aging. If the application is properly made, the "hand" is not adversely affected, and in the case of pile fabrics, is even improved where the right finishing agents are used with Erifon.

Treated fabrics retain their fire-retardant properties after normal "household" laundering (15 minutes washing with .5% soap or synthetic detergent, followed by three 5-minute rinses at 140°, 120° and 120°F.). Five launderings with .5% soap and .5 oz. NaOH per gallon of water at 210°F., followed by 6 rinses and then a .25% HF scour, destroyed the treatment.

Properly applied, Erifon will withstand dry cleaning. It is unaffected by artificial light or sunlight. It is non-toxic and does not cause dermatitis.

Sold as a concentrated solution, Erifon costs 25 cents a pound. At this price, the treatment for light fabrics will run about 2/3 cents a yard; for heavy fabrics, such as drapes, as high as 25 cents a yard.

CHARLES H. CLARK AND ROY KIRK: From their magnesium batteries, more light.

LONG-LIFE BATTERY

New dry cell uses magnesium as anode, has high capacity, good shelf life. Current research expected to lead to commercial production.

TO THE average user, a dry cell battery is a source of power that has life until it is needed for some emergency.

To the battery division of the United States Signal Corps, charged with supplying batteries for all the armed services, all uses for batteries are emergencies. Hence, its continuous search for units that work better, last longer, and can be built of non-critical materials. This research has resulted in a new dry cell battery employing magnesium instead of zinc as the anode. It boasts higher capacity (amperes x time) and promises good shelf life.

Dow's Magnesium

At the end of the war, the Signal Corps realized that although zinc production was sufficient for normal needs, it would probably be uncomfortably tight in another national emergency. Moreover, our reserves are estimated at 20-30 years' supply, and it was felt desirable to find a non-critical metal that could be substituted for zinc with as few changes in the conventional cell as possible.

Aluminum and magnesium were picked as the two most likely candidates. The former, however, was deferred when it was learned that previous efforts to use it had not been too successful. The Dow Chemical Co., able to supply virtually any amount of magnesium from the sea's vast resources, was looking for further markets for the metal and, in December 1946, set to work on the problem under a Signal Corps contract.

Initial research under Dow's William S. Loose (Roy Kirk now heads the project for the company) was directed toward finding magnesium alloys and cathode materials that would give as high capacity as the zinc dry cell. For convenience, a wet cell with a standard electrolyte solution was used in these preliminary studies. The most satisfactory anodic material found was an alloy of 3% Al, 1% Zn, 0.15% Ca and the rest Mg. Dry cell shells were made of this alloy, and the search for the best electrolyte began.

A solution of magnesium bromide is the best of the electrolyte materials tried thus far, and a paste of this with starch and wheat flour replaces the traditional ammonium chloride-starch-flour electrolyte. Manganese dioxide, the standard cathodic material in the zinc battery, still gives the best performance in the new cell and has the usual carbon rod as its extension and positive terminal. Lithium chromate is the inhibitor that prevents corrosion of the battery when it is not in use. (Zinc chloride and mercuric chloride perform a similar function in the zinc cell.)

Looks the Same

Although the new battery looks like the present "flashlight battery," it will last thirty hours (continuous discharge in flashlight-type operation) as compared to ten-twelve hours for the zinc. Due to the fact that can pitting occurs, the containers may have to be made thicker or made with a leakproof construction. A satisfactory dry cell should have three years' shelf life, and it looks as though the new magnesium cell may have this characteristic, for one-year tests are satisfactory.

Low-temperature characteristics seem to be superior to the ordinary zinc cell. The magnesium cell, however, does not match zinc cells designed especially for low-temperature operation, but it is logical to expect one tailored for such use can be developed. Another advantage is that the magnesium cells work well with manganese dioxide from domestic ores, which do not have the desirable porous form found in ores imported from the African Gold Coast.

One slight disadvantage is that the battery has a higher initial voltage than is wanted in the uses for which it is intended. Any danger of burning out equipment is prevented by short-circuiting the cell for an instant after manufacture. This drains off the excess voltage, and the cell thereafter has a normal voltage characteristic.

Cooperative Program

Work on the magnesium battery has been a cooperative affair, with Dow supplying its knowledge of magnesium and the Battery Branch of the Signal Corps' Squier Laboratory at Fort Monmouth, N. J., under Grenville B. Ellis, drawing on its experience in developing and testing batteries. (Ellis' group includes Arthur F. Daniel, chief of the battery development section; Charles H. Clark, directly in charge of the Signal Corps' end of the magnesium battery work; and David Linden, of the technical staff.) Patents are in Dow's name, but for governmental uses are assigned to the U. S. Government.

Since the basic problem has been solved, the entire industry has been asked to cooperate, and now all battery manufacturers are conducting independent research. From the Signal Corps viewpoint, the next three steps are: 1. Continue work to see if better combinations of electrolytes and inhibitors can be found. 2. Complete tests on storage characteristics. 3. Work out construction and production techniques.

Industry's objectives will be essentially the same. Because the new cell is physically and electrically interchangeable with the current zinc cell, and it can be made on existing equipment, commercial production should not be too far off.

It is expected that production costs will initially be somewhat higher than those for the conventional zinc cell, but because of its greater capacity, the Mg cell promises to supply lower cost energy than that of the zinc cell. When large-scale production is achieved, the cost of a Mg cell is expected to be no greater than that of the older zinc cell.

AIRBORNE FLUORINE

U. S. Air Forces study applications of fluoro-organics in aircraft.

A FINICKY girl describing her ideal husband has nothing on the U. S. Air Force specifying components of its new military weapons. But while no man exists who can satisfy the former, there's a good chance, thinks J. C. Mosteller, of the Air Force, who spoke before the recent American Chemical Society meeting at Atlantic City, that the ingenuity of chemists can fulfill the latter.

One direction in which fulfillment would seem to lie—for such components as heat-transfer media, hydraulic fluids, lubricants, fire-extinguishing agents, and elastomers—is toward the fluorine-containing organic compounds. Our extensive

J. C. MOSTELLER: Finickiness favors fluorine.

military program may thus provide a substantial market for these relatively costly products which, most fluorine chemists agree, are limited in their applications to special purposes where quality and safety are more important than dollars.

Inertness Counts

A contract with Purdue Research foundation provided for the study of liquid coolants based on fluorine compounds. The project was dropped when liquid-cooled engines were de-emphasized in favor of jets, but it may be renewed as a result of the present interest in supersonic flight and guided missiles. Liquids for this purpose, and also for hydraulic fluids, must not freeze up at sub-zero temperatures, nor must they decompose, burn or cause corrosion at very high temperatures. Fluorocarbons show the greatest promise.

The same qualities plus lubricity are required for lubricating oils and greases. The polyoxyalkylenes, phosphate esters, silicones, chlorofluoro-compounds and perfluoro-compounds have been studied, and fluorine-containing compounds are best from the standpoint of nonflammability. Added to petroleum base stock in proportions up to 35%, they improve the viscosity index and practically eliminate the fire hazard.

Greases are a more difficult problem: They're not "greasy" enough. More work on gelling agents must be undertaken before a satisfactory fluoro-grease can be developed.

While fluorine-containing fire-extinguishing agents are generally less efficient than those based on chlorine, bromine, or iodine, it is believed that their thermal decomposition products are less toxic. Much interest is being shown, therefore, in dichlorodifluoromethane, hexafluoroethane, etc.

Teflon and Kel-F are generally satisfactory rigid plastic materials, but there is a need for elastomers of similar inert properties. Such monomers as hexafluorobutadiene are being studied.

ACS NOTES

• RUBBERS WITH HIGH RESISTENCE to heat, oil, light, ozone, discoloration, and gas diffusion, and which retain flexibility and elasticity under compression were described by H. P. Owen, B. F. Goodrich Chemical Co., Cleveland. These rubbers are based on acrylic esters, and although they are saturated they can be vulcanized with sodium metasilicate pentahydrate and hydrated lime. One of the four described was developed as Lactoprene EV by the Eastern Regional Research Laboratory.

• MODIFICATIONS OF SILASTIC silicone rubber have been developed by Dow Corning Corp., Midland, Mich., to overcome the deficiencies of the earlier formulations: low tensile strength and elongation; brittleness at low temperature; compression set; and self-propagation of fire. New formulations improve at least one, sometimes several, of these deficiencies.

• THE SAME POLYMERIZATION stopping agents that work on ordinary GR-S don't work on cold rubber. Chemists of The Firestone Tire and Rubber Co. evaluated several for cold rubber and found dinitrophenylbenzothiazyl sulfide, dinitrophenylpyridinium chloride, and dinitrobenzenethiol to be the best. The former gave significantly better aged cut growth resistance.

SELF-CURING RESIN

Resin containing free aldehyde and hydroxyl groups is self-curing, may find use in paper, textiles.

CHEMISTS have often idled with the idea of polymerizing a simple aldehyde to produce a resin containing free aldehyde groups, for such materials might be expected to have some unusual and highly desirable characteristics. The trouble is, it doesn't work. The simplest presumably-polymerizable aldehyde, acrolein, converts to a hard, intractable mass; the aldehyde groups apparently enter into the vinyl-type polymerization and foul it up for fair.

Researchers at the Du Pont Co., in work described before the recent American Chemical Society meeting at Atlantic City, tried instead allylidene diacetate, an acrolein derivative where the extremely reactive carbonyl group is repressed by a strait-jacketing pair of acetate groups.

Allylidene diacetate doesn't polymerize well by itself, but it copolymerizes smoothly with vinyl acetate. Remove the acetate groups, and you have a resin with free aldehyde and hydroxyl groups. (The hydrolysis is analogous to the preparation of polyvinyl alcohol from polyvinyl acetate.)

Internal Embrace

Polyvinyl alcohol, which is water-soluble, can be hardened and insolubilized by treatment with formaldehyde (polyvinyl formal) or butyraldehyde (polyvinyl butyral). The aldehyde "joins hands," as it were, with two hydroxyl groups on adjoining chains, binding them into a cohesive, insoluble bundle—i.e., a resin.

But the new resin, also water-soluble, doesn't require the inconvenient, smelly treatment with an aldehyde. Films cast from water solution become insoluble by heat alone—or faster in the presence of a mild acid catalyst. The hydroxyl and aldehyde groups simply hook up together in an internal embrace, more prosaically described as acetal formation.

Commercial Possibilities

Although such a resin is not commercially produced at present, there are good reasons why production may eventually come to pass: the resin may be applied to paper for wet strength; pigments and other modifiers may be anchored by the resin to paper or fabrics; and flat fabrics may be permanently sized to give a launderable, permanent "starch" finish.

Even if the final results are no better than are obtained with present vinyl-type resins, ease of application and treatment may prove a powerful persuader.

SYNTHETIC AIR

Development of a self-contained breathing apparatus has brought about tonnage production of potassium metal and superoxide.

TONNAGE production of two new chemicals, metallic potassium and potassium superoxide (K_2O_4), was described by C. B. Jackson of the Mine Safety Appliances Co. before the American Chemical Society meeting at Atlantic City last month. This was the outgrowth of a research program started in 1935 by the U.S. Navy to develop a self-contained breathing apparatus without use of compressed oxygen. Considerable effort had already been expended to make sodium peroxide work, particularly in France and Germany, without success.

K_2O_4 MASK: You can take it with you.

Navy researchers turned to potassium superoxide as a substance which would evolve oxygen, control humidity, and remove the carbon dioxide as potassium carbonate from the wearer's exhaled breath. However, production of the superoxide, fairly readily carried out by combustion of metallic potassium in air, required the then-unavailable metallic potassium for its success.

Potassium First

All lines seemed to point to metallic sodium for production of potassium from its compounds. Navy researchers let sodium react with potassium chloride to form a potassium-sodium alloy (60% K). Vapor-phase combustion of this alloy formed a mixture of sodium peroxide and potassium superoxide which was utilized until the pure potassium superoxide was available. When work moved from the Navy to Mine Safety Appliances Co., the potassium-sodium alloy was condensed rather than burned directly. Pure potassium metal was obtained by distillation of this mixture through a stainless steel column packed with stainless steel raschig rings. The final production unit combined the potassium chloride reduction and potassium distillation and combustion units into a continuous unit capable of producing 3-5 tons of potassium superoxide per day. Combustion is achieved by atomizing the metal into an excess of air. This yields over 95% of a very light fluffy material.

The combustion product is molded to give a hard cake which is granulated and screened to proper mesh size. Approximately two pounds of the granulated product is the actual charge in the canister. This canister lasts approximately one hour even when the wearer is doing heavy labor.

ACS BRIEFS

Many of the 1,065 papers from the 116th ACS meeting were of particular interest to industry.

• A POSSIBLE ALTERNATIVE commercial source of rutin, an anti-hemorrhagic agent now obtained from buckwheat, is mature asparagus, reported A. E. Stevenson, Continental Can Co., Chicago. Rutin content of the plant increases after the tender, edible portion is harvested. Possible hitch: Harvesting of the mature plant in the late fall for its rutin content may cut the following year's crop of edible asparagus.

• UNSUNG HERO of superphosphate fertilizer, according to Vincent Sauchelli, Davison Chemical Corp., Baltimore, is sulfur, an element largely ignored by farmers and soil experts. By demanding highly concentrated fertilizer (i.e., more calcium phosphate, less calcium sulfate) farmers may be doing themselves great disservice.

• CHEMISTS OF THE U. S. Department of Agriculture's Northern Regional Research Laboratory, Peoria, Ill., have discovered that a yeast-like organism, *Ashbya gossypii,* promotes formation of riboflavin by fermentation in various organic media. Total estimated plant production cost: 3.75¢ per gram.

• COMPETITION FOR THE popular antihistamine agents is suggested by a new approach to the allergy problem: prevention of histamine formation within the body rather than—as presently—interference with its effects. Chemists of the National Drug Co., Philadelphia, reported that certain chemicals related to vitamin P, viz., *d*-catechin and epicatechin, inhibit the activity of the enzyme that produces histamine.

• A PROCESS FOR dissolving small pieces of quartz and redepositing it on a "seed" to produce a single, large, perfect crystal was described by A. C. Walker and E. Buehler, Bell Telephone Laboratories, Murray Hill, N. J. The process takes place in an autoclave at about 400° C. and 15,000 psi pressure. The solvent is a strong alkaline solution, expansion of which under heat generates the pressure.

• BECAUSE OF BERYLLIUM'S increasing industrial importance, beryllium poisoning is a correspondingly graver problem. Scientists of the University of Chicago Toxicity Laboratory have demonstrated that beryllium interferes with carbohydrate metabolism; it combines with the same cell components as calcium and magnesium but is unable to fulfill the functions of these metals and thereby interrupts the metabolic process. Knowledge of beryllium's mode of action may hasten discovery of a preventive or cure for its toxic manifestations.

• MORE EFFICIENT PRODUCTION of alcohol from the South American cassava plant, source of tapioca, is promised by use of submerged-culture fungal enzymes in a process described by chemists of Joseph E. Seagram & Sons, Inc., Louisville, Ky., as considerably less costly than the barley malt process used in the U. S.

• LIKE SOAP, PENICILLIN is a micellar colloid, reports E. A. Hauser, Massachusetts Institute of Technology. Watching penicillin attack a germ colony under an ultramicroscope, Professor Hauser described the action as an enveloping of the bacterial colonies by penicillin micelles. Awareness of the surface activity of penicillin attack may improve clinical operation.

• POLYVINYL FATTY ACID ESTERS of potential commercial utility have been prepared by chemists of the Eastern Regional Research Laboratory, Philadelphia. Those described were the palmitate, caprylate, and laurate. S. A. Harrison and D. H. Wheeler, of General Mills, Minneapolis, reported on the other hand that vinyl and allyl esters of soybean and cotton seed fatty acids gave poor polymers. The explanation is that the peroxide catalysts, instead of initiating polymerization, react instead with the unsaturated linkages in the acids.

• WORK DONE BY THE Bureau of Mines, at Bruceton, Pa., indicates that the Oxo reaction can be used to produce alcohols directly. They have heretofore been made by reduction of aldehydes. In this work furan, 2,5-dimethylfuran, and hexene gave

tetrahydrofurfuryl alcohol, 2,5-dimethyl-3-tetrahydrofurfuryl-carbinol, and heptanol, respectively.

• ASSUMING A BLACKSTRAP MOLASSES cost of 5¢ a gallon, it should be possible, claimed R. S. Aries, Polytechnic Institue of Brooklyn, to produce methyl lactate at 7½¢ a pound and 50% plastic-grade lactic acid at 3¢-6¢. Acrylic plastics might thus be made more cheaply via lactic acid.

• DOUBTS AS TO THE EFFICACY of many triethylene glycol dispensers in ridding air of germs was expressed by Saul Kaye, Department of Medicine, University of Chicago. He pointed out that the calculated concentration is always too high as a result of ventilation, condensation, and settling of coarse mist particles.

MIXERS' DELIGHT

Simple continuous chemical process substitutes for slow grinding operations in pigment dispersion.

DISPERSING metal pigments in oils and resins by usual methods is literally a tough grind: pigments are mechanically ground with the liquid components of the mix for long periods in heavy ball or roll mills until uniform dispersion is achieved.

The Kol process (name derived from *colloid*) developed by Commonwealth Engineering Co., Dayton, Ohio, promises to change all that. This is a simple continuous method by which pigments are incorporated with oils and resins into a paste while the water is simultaneously taken out of the pigments. With resins being employed in almost all industrial finishing formulations today, it is a new approach to an increasingly important problem. It has been used successfully with zinc, lead and titanium pigments, and samples have been on the shelf for some years without deterioration. One company has just begun to use the process commercially.

The first step is saponification of the vehicle raw material with an alkaline agent. Next, to the gently heated saponified oil, pigment is added, either as press cake or slurry. Then a small amount of a weak acid such as acetic anhydride effects precipitation of the pigment and fatty acid oil components, and the water which separates out is discarded. Glycerine is then introduced and the mixture subjected to a heat treatment to esterify the fatty acids and produce the mono-, di-, and tri-glycerides of these acids. The product is an oily pigment paste dispersion of smooth consistency, comparable to the present grinding-mill product.

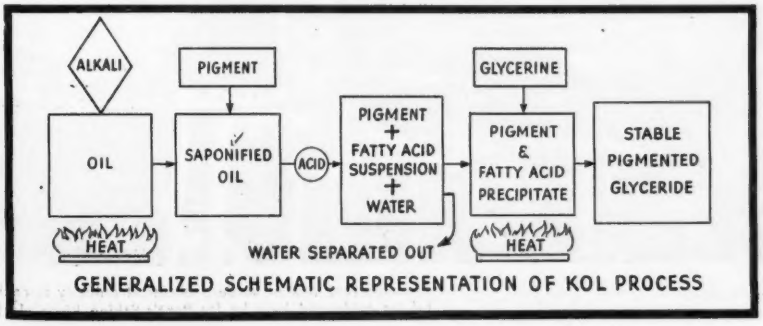
Variants of this procedure will produce pigmented oil gels, fatty acid glycerides, resins and resin gels. Such pigmented pastes are important in the manufacturing of many products, including plastics, paints, inks, linoleums, rubbers, and cements. Eight U. S. patents have been issued so far on various phases of the Kol development, and other applications are pending. With the patent picture substantially complete, Commonwealth is now licensing the process.

Simple Equipment

A stainless steel tank with suitable heat control and stirring apparatus is all that is required by this process. Such equipment can be integrated with similar equipment normally used in processing paints and plastics subsequent to pigment dispersion, and thus replace the batch method now in use with a continuous arrangement.

Simple and sensitive control is possible with continuous production. In addition, elimination of heavy grinding equipment means substantial reduction in machinery costs, and the simplicity of operation cuts labor costs.

The product is a paste similar to any other paint paste, and can be delivered in pails, kegs and drums. Color can be incorporated at the same time the transfer process is taking place if desired. The product can be cut to suit the requirements of the user of the industrial finish.



GENERALIZED SCHEMATIC REPRESENTATION OF KOL PROCESS

FISSION MISSION

AEC takes first big step toward development of atomic power plants.

THE Atomic Energy Commission recently laid the groundwork for its first big step in the direction of atomic power for industrial use. It acquired a 400,000-acre tract in the Snake River plains of Idaho on which it will build a plant designed to carry out a series of large-scale studies on the techniques and effects of neutron bombardment at intensities far exceeding any heretofore achieved, even in the large production reactors at Hanford, Wash. In order to test fuel and structural materials under the severe conditions of temperature and radiation which will be encountered in the power reactors of the future, the Commission has contracted with the Chemical Plants Division of Blaw-Knox Co., Pittsburgh, Pa., for the engineering design of several materials testing reactors to be placed in the new plant.

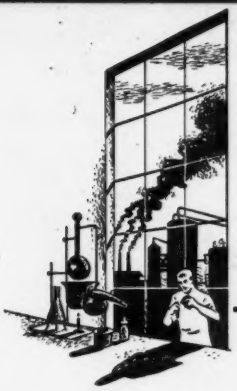
Work on this project is being conducted under Lawrence R. Hafstad, Director of the AEC's Division of Reactor Development, and L. E. Johnston, AEC's Manager of Idaho Operations. Initial studies were made at the Oak Ridge National Laboratory, Oak Ridge, Tenn., and since early in 1949 the project has been a joint effort with the Argonne National Laboratory, Chicago. Ill. The contract with Blaw-Knox covers architect-engineer services and includes engineering design of the materials testing reactors and preparation of detailed specifications and cost estimates.

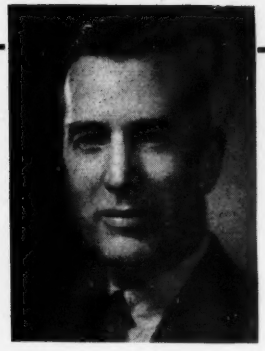
Multi-Million Project

A steering committee comprising members of the scientific staffs of the Argonne and Oak Ridge Laboratories has been set up to act in an advisory capacity to Hafstad and Johnston. The Blaw-Knox designs will be studied and reviewed by this group and a decision reached on authorization of construction contracts. The AEC and Blaw-Knox will let these contracts. The entire project is expected to cost many millions of dollars and will take several years to complete.

This powerful new tool will further the whole reactor development program and play a vital part in the development of atomic plants for the production of power and atomic engines for the propulsion of ships and possibly aircraft. The new reactors will also provide an intense source of neutrons for use in experiments in nuclear physics, and it is expected that many new by-products will be made available for research and development in the medical and other scientific and technological fields.

An important tool of modern chemical industry is capital, as evidenced here by Du Pont's Sabine River plant.





THE ESSENTIAL ELEMENT

The future holds no single factor so important to our security as the continued investment of venture capital in the tools of production.

by CRAWFORD H. GREENEWALT, President
E. I. du Pont de Nemours & Co., Inc.

THE direct relationship between increased productivity and improved living standards is an axiom that no one seriously questions. It is equally obvious that productivity increases only as man's effectiveness is multiplied by the variety and number of tools with which his work is done. In the United States we have the greatest array of productive equipment the world has ever seen, and as a direct result we have also the world's highest standard of living. That is simple cause and effect, and it follows inescapably that improvement and even maintenance of those high standards requires a continual increase in the manufacturing sinews upon which our well-being depends.

The machinery of production is the result of thrift, of the collective willingness of people to forego the pleasure of an immediate expenditure to provide for their future security. The results of that thrift have been staggering. In 1849 the average capital invested per wage earner employed was about $600. In 1949, one hundred years later, with a greatly increased population, the investment per worker has increased to nearly $6,000. That tenfold increase in the tools of production has brought about a flood of goods and services that have made us the richest nation on earth.

THE FUTURE HOLDS no single factor so important to our well-being and security as the continued investment of venture capital in the tools of production. Should that well of venture capital dry up, our country will indeed turn into a dessert. If that well can be made to flow ever more abundantly, we will continue to be the envy of the civilized world.

The task before us is enormous. It has been estimated that the annual net increase of our labor force is approximately 700,000 people. Simply to provide jobs for that number would require an investment by industry amounting to something over 4 billion dollars per year, and that of course does no more than maintain the status quo. If we are to go forward we must increase regularly the amount invested per worker and provide also for the obsolescence and retirement of existing plant. To fulfill these needs, providing for only a modest annual increase in available goods and services requires an over-all annual increase in productive equipment of perhaps 20 to 25 billions of dollars.

THESE ARE OVER-ALL figures, applying to industry as a whole, but it is clear that the major burden must be borne by those industries in which the possibilities for rapid growth, expansion, and diversification still exist. The chemical industry in particular must bear a disproportionate share of that responsibility, for it is young and vigorous and holds within its research institutions the seeds of great growth. We have the challenge; we have also the opportunity.

Against that clear obligation for industry as a whole, and for the chemical industry in particular, it is distressing to note the alarming decline in the availability of venture capital. The great investments made by the chemical industry since the war's end have come largely from retained earnings. However, retained earnings are a weak reed on which to rest prospects for further substantial investment since they depend too importantly on the vagaries of the business cycle. Unfortunately also that source of new capital is not available to the small manufacturer struggling with the problems of a new product or a new business. Encouragement of such new enterprises is essential to the preservation of our competitive economy.

Venture capital must stem primarily from savings—from the thrift of the average individual and from the enlightened self-interest that leads him to provide for himself and for his own a measure of security through the return he reaps from investment of those savings.

Available statistics appear to indicate that current savings are ample to finance any reasonable annual increase in our productive investment since it has been estimated the total liquid savings have increased by nearly $190 billions in the years 1940 through 1948. In that same period, however, only a negligible addition has been made to the sum total of non-governmental securities, and in the last three years only 5% of the vast sums invested in new plant have come from new issues of preferred and common stocks. The reasons for these changes in investment policy are unfortunately all too clear. Governmental tax policies have so reduced the net return on venture capital that savings have been driven into essentially nonproductive channels where venture is sacrificed to security.

SO THE CHEMICAL INDUSTRY finds itself faced with a paradox. Research laboratories are providing ample opportunities for investment—abundant new developments which could make their contribution to the public welfare and amply discharge the industry's responsibility for improving the living standards of our country. It is tragic in the face of that clear opportunity that the wells of venture capital should be drying up, not because our people have lost courage but because the tax laws as they now exist penalize venture and encourage timidity.

The problem perhaps is one of imparting a better understanding to the American people; so they will see that their security depends on a steady increase in the tools—such as those described on the following pages—with which their efforts are multiplied, that venture capital is the lifeblood of industry, and that investment of savings in the enterprises of the nation is the essential element of future greatness.

Competitive processes are waging war for control of aliphatic chemicals output. Ethylene glycol is a case in point.

SHARPER COMPETITION SPURS NEW CHEMICAL DEVELOPMENTS

FORWARD IN THE CHEMICAL INDUSTRY

● The chemical industry is soaking its feet in a cool mountain stream. After running uphill for a decade, it has stopped to rest; and it looks as if the climb from now on will be at a normal, evolutionary pace, rather than a pell-mell rush. Postwar expansion has slowed down, and the adequate supply of most chemicals has sharpened sales effort, research, and new product development in a strong bid for the consumer's dollar.

In the aliphatics field prices of fermentation-produced solvents have fallen. Acetylene processes and hydrocarbon oxidation have moved forward, and heightened interest has been shown in the Oxo reaction. Coal-tar hydrocarbons are again in good supply, partly as a result of tapering phthalic, DDT and 2,4-D production. Turning to the inorganics, ammonia and phosphates have undergone expansion. Other developments well worth noting are hydrogen cyanide from natural gas, sulfur from petroleum, hydrazine, refined potash salts, titanium and gallium. Among the polymers, cold rubber, fluorine plastics, acrylonitrile fiber (Orlon), Terylene and polyamides share the spotlight.

Higher sales, higher exports, and new products characterized the pharmaceutical industry in the past year. Progress was especially marked in antibiotics, vitamin B_{12}, cortisone, ACTH, and use of radioactive isotopes. The naval stores industry saw high-volume output of chlorinated camphene (toxaphene), introduction of rosin amine, and growing use of cumene hydroperoxide, tall oil, and rosin soap. The dye industry caught up with demand, and there is a trend now afoot to produce domestically dyes that were formerly imported.

ALIPHATIC CHEMICALS

by E. H. RIDDLE
Special Products Department,
Rohm & Haas Co.

MOST of the postwar expansions in the aliphatic organic chemicals field have been completed during the last twelve months, and 1949 has become the year in which, for the first time in a decade, the emphasis is on sales rather than production. This has brought into sharper focus the competition between processes for manufacturing some of the basic aliphatics. Of particular interest is the increasing production from hydrocarbon oxidation plants, whose output of formaldehyde, methanol, acetaldehyde, acetone, propionaldehyde, *n*-propanol, butanol and isobutanol offers competition with the older processes for producing these chemicals. Formaldehyde was one of the first of the aliphatics to feel the effect of this competition. This has an inevitable effect on the methanol market, and the all-time record of synthetic methanol production in 1948 (990,-240,000 lbs., double the 1947 production) is not expected to be reached in 1949. The advent of paraformaldehyde in flake form at a price close to that of the 37% formalin solution is another interesting development in this competitive market.

One of the most drastic changes in the last year came in the price of fermentation ethyl alcohol, which plummeted from 70c per gallon in November, 1948, to 18-20c in March, 1949 (it has since recovered somewhat and will probably level off in the 25-30c range). Principal causes were the cornering of the molasses market by one fermentation producer, and the advent of increased capacity for synthetic ethanol from ethylene. It has been estimated that 70% of all of the ethanol is now being produced from ethylene, nearly half of this in the Texas area. The newest ethanol-from-ethylene plant is reported to use a direct catalytic hydration process, instead of passing through ethylsulfuric acid as intermediate.

The price of fermentation grade *n*-butyl alcohol also dropped at about the same time as ethanol, falling in October from 32c to 17.5c per lb., to be directly competitive with synthetic butanol. Since that time, competition has brought both synthetic and fermentation butanol down to 12.5c per lb.

Ethanol is a key figure in the competition between processes that is developing in the chemical industry of the Southwest. While the Fischer-Tropsch synthetic gasoline process does not seem to be quite the threat to the ethanol industry at the moment that it was once thought to be, nevertheless in 1950 it is expected that about 5 million gallons of ethanol (about 3% of present production) will be available as a by-product of the Fischer-Tropsch plant that is now under construction. The second synthetic gasoline plant which had been announced has since been canceled because of excessively high costs; increased optimism on petroleum reserves may also have played a part in this decision.

Direct oxidation of hydrocarbons, already mentioned above, produces significant quantities of acetaldehyde to compete with ethanol as a source of this intermediate. The importance of this is shown by the estimate that 40% of all ethanol production in 1948 went into acetaldehyde manufacture. Furthermore, acetylene produced from natural gas and then hydrated

Competitive processes are waging war for control of aliphatic chemicals output. Ethylene glycol is a case in point.

SHARPER COMPETITION SPURS NEW CHEMICAL DEVELOPMENTS

FORWARD IN THE CHEMICAL INDUSTRY

● The chemical industry is soaking its feet in a cool mountain stream. After running uphill for a decade, it has stopped to rest; and it looks as if the climb from now on will be at a normal, evolutionary pace, rather than a pell-mell rush. Postwar expansion has slowed down, and the adequate supply of most chemicals has sharpened sales effort, research, and new product development in a strong bid for the consumer's dollar.

In the aliphatics field prices of fermentation-produced solvents have fallen. Acetylene processes and hydrocarbon oxidation have moved forward, and heightened interest has been shown in the Oxo reaction. Coal-tar hydrocarbons are again in good supply, partly as a result of tapering phthalic, DDT and 2,4-D production. Turning to the inorganics, ammonia and phosphates have undergone expansion. Other developments well worth noting are hydrogen cyanide from natural gas, sulfur from petroleum, hydrazine, refined potash salts, titanium and gallium. Among the polymers, cold rubber, fluorine plastics, acrylonitrile fiber (Orlon), Terylene and polyamides share the spotlight.

Higher sales, higher exports, and new products characterized the pharmaceutical industry in the past year. Progress was especially marked in antibiotics, vitamin B_{12}, cortisone, ACTH, and use of radioactive isotopes. The naval stores industry saw high-volume output of chlorinated camphene (toxaphene), introduction of rosin amine, and growing use of cumene hydroperoxide, tall oil, and rosin soap. The dye industry caught up with demand, and there is a trend now afoot to produce domestically dyes that were formerly imported.

ALIPHATIC CHEMICALS

by E. H. RIDDLE
Special Products Department,
Rohm & Haas Co.

MOST of the postwar expansions in the aliphatic organic chemicals field have been completed during the last twelve months, and 1949 has become the year in which, for the first time in a decade, the emphasis is on sales rather than production. This has brought into sharper focus the competition between processes for manufacturing some of the basic aliphatics. Of particular interest is the increasing production from hydrocarbon oxidation plants, whose output of formaldehyde, methanol, acetaldehyde, acetone, propionaldehyde, *n*-propanol, butanol and isobutanol offers competition with the older processes for producing these chemicals. Formaldehyde was one of the first of the aliphatics to feel the effect of this competition. This has an inevitable effect on the methanol market, and the all-time record of synthetic methanol production in 1948 (990,-240,000 lbs., double the 1947 production) is not expected to be reached in 1949. The advent of paraformaldehyde in flake form at a price close to that of the 37% formalin solution is another interesting development in this competitive market.

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to acetaldehyde is another potential threat, the imminence of which is indicated by the recent announcement that one acetaldehyde producer definitely is going to produce acetylene by the cracking of hydrocarbons in Texas. In addition, a large producer of acetaldehyde from ethanol has been surveying plant sites in the Southwest, presumably for acetylene from natural gas. On the other hand, plans for the construction of a commercial unit employing the Schoch low-temperature electric discharge process for producing acetylene from hydrocarbons have been delayed indefinitely or perhaps shelved entirely.

It is no surprise that the Southwest continues to lead in the volume of new construction in the aliphatic chemical industry. And while there does not seem to be much doubt that sufficient natural gas and refinery gas will be available, the increasing price of these gases is a matter of considerable concern, particularly since the chemical uses of these gases are not a sufficiently large proportion of their outlets to have an effect on the price of the hydrocarbons. Propane and butane have been increasing in price as a result of the accelerated use of liquefied petroleum gas (LPG) for heating purposes, and it has been estimated that 21% of LPG sales were to the chemical industry in 1948. However, the volume of LPG used for fuel purposes may start decreasing because of increasing availability of natural gas by pipelines in many parts of the country. As a result of these increasing pipeline demands, it has been predicted that natural gas at the well head will sell for 15-20¢ per thousand cubic feet within the next few years, compared with 5-10¢ today. These shifts will naturally have their effect on the competition between processes that use methane on the one hand, and propane-butane on the other. They may also have their effect on chemicals such as the nitroparaffins, which have been held up from large-scale production partly because of the unfavorable propane situation.

One effect of rising methane and propane-butane prices may be the increasing use of ethane as a raw material, and a thermal cracking process for converting ethane to ethylene has recently been announced. Other important developments in the ethylene field include the adaptation of the Thermofor cracking process to ethylene manufacture, and the design of a Hypersorber plant for recovery of ethylene from a refinery stream.

One of the most important chemicals derived from ethylene is ethylene glycol; production of this chemical increased to 367 million pounds in 1948, compared with 227 million pounds in 1947, and it was still increasing in the first quarter of 1949. Other petroleum-based chemicals whose production capacity was expanded in the last year include ethylene oxide, ethyl chloride, synthetic glycerol, 2-methyl-2,4-pentanediol, *sec*-butyl alcohol and methyl ethyl ketone.

New producers of 2-ethylhexanol and urea appeared on the horizon, and plans were announced for new plants to manufacture perchloroethylene and trichloroethylene. Increased capacity for distilled fatty acids was placed in operation recently, and expansion of fatty alcohol production by catalytic hydrogenation is reported to be under consideration. Secondary fatty amines became available commercially for the first time, as well as the corresponding quaternary ammonium salts.

OXO PROCESS

Large-scale production of C_8 and C_9 alcohols by the much-heralded Oxo process was started in the last twelve months with their principal outlet the manufacture of esters such as the phthalate and adipate for use as plasticizers. On the other hand, at least two companies considering production of an Oxo alcohol withdrew from the field partly because of high construction costs. Availability of a higher alcohol in the C_{12} to C_{16} range from the Oxo process, suitable for sulfating for detergent use, has been limited to a laboratory curiosity status, commercial production being dependent upon obtaining a source of a suitable olefin. The use of the Oxo process as a source of aldehydes has not been overlooked; a pilot plant was constructed for preparing a C_9 aldehyde and several of its derivatives, and other aldehydes can be expected from this program as the development work is completed.

The advent of cold rubber is expected to increase the demand for butadiene, bringing idle capacity back into production. This hydrocarbon is also reported to be the raw material for the nylon intermediates to be manufactured in a multimillion dollar Southwest plant recently announced. If these reports are right, this will be the first large commercial non-monomer use of butadiene.

Another nylon process also making news is the production of adiponitrile from furfural, from which has come commercial quantities of furan and tetrahydrofuran. Other heterocyclic and open-chain derivatives of furfural can be expected from this program, including pyrrole, pyrrolidine, 1,4-dichlorobutane, methylfuran, and dihydropyran.

During the year a plant was completed for producing chemicals from acetylene under high pressure. Initial products available from this unit include dimethyl chloroacetal and a number of vinyl ethers in tankcar quantities, and 1,4-butynediol, 1,4-butanediol, and malonaldehyde tetramethylacetal in development quantities.

Pilot-plant facilities were completed during the year for β-propiolactone, and five derivatives of this reactive chemical (β-carboxyethylbenzothiazyl-2-sulfide, β-isothioureidopropionic acid, β-dithiocarbamylpropionic acid, β-chloropropionic acid, and β-mercaptopropionic acid) which have been made available recently in experimental quantities are undoubtedly forerunners of other propionic acid derivatives from this source.

The Reed process for the sulfonation of paraffin hydrocarbons is now being developed on a commercial scale in this country, and out of this has come sodium alkylsulfonates, sulfonyl chlorides, sulfonate esters, and sulfonamides.

While the major emphasis in the agricultural chemical field continues to be centered on aromatic chemicals, some interesting developments occurred in the aliphatic sector, including the introduction of sodium trichloroacetate as a grass killer; the projected commercial synthesis of cinerin I and II, the active ingredients of pyrethrum; and new insecticides derived from hexachlorocyclopentadiene and related to chlordane. New developments in phosphates include tetraethyl dithionopyrophosphate, octamethyl pyrophosphoramide (also known as Pestox III), and bis - (dimethylamino) - fluorophosphine oxide; however, none of these have yet been established in field tests.

The steady outpouring of new research and pilot plant chemicals continued unabated during the last year. In addition to those already listed above, others included α-hydroxyadipaldehyde, 2,4-dimethyl-2-methoxymethyl - glutaraldehyde dimethyl glutarate, 1,2,6-trihydroxyhexane, 2,2,6,6-tetramethylolcyclohexanol, 2-methoxymethyl-2, 4-dimethyl-1,5-pentanediol and the corresponding 2-ethoxymethyl derivative, glycerol allyl ether, dioxolane, Nopol from beta-pinene and formaldehyde by the Prins reaction, ethanolhydroxyacetamide, N,N-dimethylcarbamyl chloride, methylurea, β-chloropropionitrile, dimethyl and diallyl cyanamides, sodium dicyanimide, potassium dicyanoguanidine, and a variety of fluorocarbons. From two new entrants into the organosilicon field came ethyl-, butyl-, and amyltrichlorosilanes, and ethyl- and amyltriethoxysilanes.

As far as the crystal ball department is concerned, some of the trends have already been indicated in the previous discussion. One that has not yet been mentioned is the increasing availability of the three-carbon compounds *n*-propanol, propionaldehyde, and propionic acid. These are now available in substantial quantities for the first time as co-products of the oxidation of hydrocarbons, and the supply will increase appreciably when the water-soluble by-products of the Fischer-Tropsch plant under construction become available in 1950. The unsaturated C_3 compounds, acrolein and acrylate esters, are expected to become

more important as their prices come down.

A lot of research has been going on in recent years in the field of free-radical reactions, and it is quite likely that free-radical processes will become more important commercially in a few years.

It can be seen that new processes are not only competing effectively with older methods for making established chemicals, but are also opening up new horizons in the form of chemicals not heretofore available commercially.

COAL-TAR CHEMICALS

by G. D. BIEBER
Koppers Co., Inc., Chemical Division
Chicago, Illinois

AFTER producing coal-tar chemicals at capacity levels during the war and the ensuing postwar period, the industry was at last able to catch its breath. After the year's end some of the exasperating shortages had been alleviated. Again, as in prewar years, benzene, phenol, tar acids, and naphthalene were available for immediate shipment. Even the once insatiable demand for phthalic anhydride appears to be satisfied.

NEW CHEMICALS

A number of new coal-tar chemicals emerged from research laboratories, pilot- and full-scale plants. Nonyl phenol, octyl phenol, isopropyl phenols, and 2,4,6,-tri-(dimethylaminoethyl) phenol are among the new phenolic compounds. New fluoro-compounds were introduced, such as pyridinium hexafluorophosphate, *m*-chlorobenzenetrifluoride, *m*-nitrotrifluoromethylbenzene, and bis(trifluoromethyl) benzene. Benzyldiethylamine and *β-tert*-butyl adipic acid are available in pilot-plant quantities. Benzonitrile, 3,4-dihydroxyphenylalanine, diphenylacetonitrile, di (2-ethylhexyl) terephthalate, monochloronaphthalene, dichloronaphthalene, tetrahydrophthalimide, salicyl alcohol, and 5.7-dihydroxy-4-methyl-coumarin have also been added to the list of new chemicals.

A new low-cost process for producing cresols synthetically from toluene using a boron catalyst was announced. According to reports a new catalyst will be used in a plant now under construction for the production of phenol from monochlorobenzene. Commercial use in this country of a silica catalyst, developed in Germany, is said to result in longer catalyst life and to improve the yield of phthalic anyhdride. During the year, production of synthetic rubber by the "cold rubber" process was begun on a large scale. A new tanning process using glyoxal and resin-forming agents such as phenol is reported to make possible lower-cost leather products. Phenylacetic acid, resorcinol, and di-*tert*-butyl-*p*-cresol are now available in flake form.

PEST-CONTROL AGENTS

Compound 118, a complex hexahydronaphthalene is said to be at least equal to gamma-benzene hexachloride. Di(*p*-chlorophenyl) methylcarbinol is reported to be effective against red mites. A spray containing *p*-chlorophenoxyacetic acid is said to aid in the production of earlier and larger tomatoes. Benzydryl-*n*-butyl ether is a mothicide while O,O-diethyl-O-*p*-nitrophenylthiophosphate is a promising new insecticide. Methoxychlor, otherwise designated as 1-trichloro-2,2-bis(*p*-methoxyphenyl)ethane is being utilized as a substitute for DDT. The compound α-phenyl-β-acetylethyl-4-hydroxycoumarin is a rodenticide.

MEDICINALS

Medicinal research again resulted in the discovery and commercial production of a number of new drugs. Methyl and ethyl *p*-diethylaminobenzoate are said to be very effective against sunburn. A new pain-killing drug, 1-(β-dimethylaminoethoxy)-4-butylquinoline and *n*-methyltetrahydroisoquinolines as high blood-pressure depressants were announced. Decapryn succinate is a new hay fever remedy. The compound, *p*-(aminoethyl) benzenesulfonamide hydrochloride is reported to attack a large number of bacteria. *P*-Aminosalicylic acid has been utilized in the treatment of tuberculosis and N-(1-benzyl-3-dimethylcarbamyloxy)pyridinium bromide is a new cholinergic drug.

INORGANIC CHEMICALS

by KENNETH A. KOBE
Professor of Chemical Engineering
University of Texas

THOSE chemical twins, nitrogen and phosphorus, have shown the greatest activity in the inorganic field. Expansion of existing ammonia plants and announcements of new construction have made headlines during the year.

Dow,, at Freeport, Texas, has just announced plans to construct a 100-tons-per-day plant. Du Pont, at Victoria, Texas, has started construction on a plant in which the ammonia will be used mainly for nylon salts.

All of the war-time plants are in full operation and many have undergone considerable expansion in both capacity and variety of products. Thus, Lion Chemical has expanded its ammonia production to 570 tons; added a 300-ton sulfuric acid plant; will make 380 tons daily of ammonium sulfate; and expanded the ammonium nitrate plant. Spencer Chemical markets a new product, Spensol, a high-concentration ammonium nitrate solution plus free ammonia to be added directly to mixed fertilizers. Methanol converters have been added to take up the seasonal slack in fertilizers. Phillips Chemical has leased Cactus Ordnance and doubled its capacity. It has placed in operataion at Houston, Texas, a 200,000-tons-per-year ammonium sulfate plant and will build a nitrate plant nearby.

Ammonium salts will face increased competition from urea, for the Solvay Process Division of Allied Chemical and Dye has under construction a new urea plant and Du Pont has more than doubled its urea capacity.

Another chemical reagent may become a cwt. chemical (if not tonnage) as the result of the Army Ordnance contract with Mathieson Chemical to produce anhydrous hydrazine for experimental use as a rocket fuel.

Nitric oxide by Westvaco's process of direct combination of atmospheric nitrogen and oxygen at the high temperature achieved in a gas fired regenerative furnace is still undergoing pilot-plant tests at San Jose, California. The first process for fixation of atmospheric nitrogen may be back without the arc that caused its demise. Interest continues in nitrous oxide from the direct oxidation of ammonia.

Rohm and Haas, at Houston, Texas, put into operation its new plant for the production of hydrogen cyanide in which methane, ammonia and air react on a platinum catalyst to form HCN and water vapor. In addition to this novel reaction, the pure methane required for the process is prepared from natural gas by a Hypersorber which removes all of the components except nitrogen.

WESTERN PHOSPHORUS AND POTASH

Western phosphate is booming as Westvaco Chemical Division and the Simplot Fertilizer Company expand their Idaho operations. Simplot makes superphosphate fertilizer, has added an ammonium sulfate plant, and will add another for ammonium phosphate. Westvaco has a phosphorus furnace plant in operation and is already expanding. A new phosphate plant will be built at Newark, Cal., adjacent to its present magnesia and bromine plant, to utilize the elemental phosphorus shipped from Idaho. Manganese Products, Inc., at its Seattle plant, is fusing phosphate rock and olivine to product a calcium magnesium phosphate fertilizer.

Potash producers at Carlsbad, N. M., have increased production and purity of potassium salts as new units have been put into production. International Minerals and Chemical Corp. is now operating a new potassium sulfate plant in which langbeinite is utilized. Both International and Potash Company of America are making a refined grade of potassium chloride (U. S. Potash Company has done this from the start) using submerged combustion heating and flash vaporization crystallizers.

PETROSULFUR

If the stockyards were to utilize the odors that drift away, the situation would be comparable to the petroleum refineries' utilizing the hydrogen sulfide produced from sour crudes. Refineries and natural gas plants are now producing considerable sulfur (still a small percentage of total U. S. production) from hydrogen sulfide formerly flared. Two plants will process refinery hydrogen sulfide: Hancock Chemical Co., in the Los Angeles area and Freeport Sulfur Co., which will use the gas from Texaco's Eagle Point, N. J., refinery. Hancock supplies neighboring refineries with diethanolamine solution, which is used to absorb the hydrogen sulfide; and the fouled solution is returned to Hancock for regeneration of the solution and oxidation of the hydrogen sulfide. Southern Acid and Sulfur Co. has operated a plant in sour gas fields of Arkansas since 1940. Sulfur recovery is now extending to Wyoming sour gas where one field produces gas containing over 20 per cent hydrogen sulfide. Stanolind Oil and Gas Co. will erect one plant and Texas Gulf Sulfur Co., the other. It is interesting to note that the natural sulfur producers, Freeport and Texas Gulf, are expanding into the new field.

Canada has two processes to give domestic sulfur. International Nickel Co. will oxidize pyritic copper-nickel sulfide ores with industrial oxygen to make a gas with a high sulfur dioxide concentration, which Canadian Industries, Ltd., may liquefy for adjacent sulfite pulp mills. Noranda Mines, Ltd., heats iron pyrites to volatilize half of the sulfur which is then condensed, and the other half of the sulfur, now ferrous sulfide, is oxidized to sulfur dioxide and iron oxide which is subsequently recovered and used as blast furnace charging stock.

The Pacific Northwest will have its first large sulfuric acid plant at the Tacoma smelter of the American Smelting & Refining Co., where a 100-ton plant is being installed to utilize the sulfur dioxide obtained from reacting the copper sulfide ores brought to the smelter.

The sulfur-from-natural-gas trend is reversed when the two are made to react by Pure Oil's process to give carbon disulfide and hydrogen sulfide. The Barium Products Corp. at Charleston, W. Va., will market the carbon disulfide and use the hydrogen sulfide to manufacture sulfide chemicals.

HALOGEN PROGRESS

The saturation of the market with caustic soda and the continued high demand for chlorine has thrown the caustic-chlorine market out of balance. Much more attention is being paid to chlorine-without-caustic processes. Today's version of the Deacon process for chlorine from hydrochloric acid has been presented in numerous patents to both chemical and petroleum companies. National Distillers Products Corp. is building in Ohio a $10-million plant for chlorine, sodium metal and sodium hydride. Other new chemical developments will center around metallic sodium. The Ethyl Corp., at Baton Rouge, La., is expanding its sodium-chlorine plant. Excitement about the mercury cell has settled to a construction basis with several new and old plants installing one or another type of mercury cell. Mathieson has made Blaw-Knox the sole licensing agent for its mercury cell. The Krebs cell is in operation at the Dominion Alkali and Chemical Co.'s plant in Canada. Dow will try the mercury cell in its Canadian plant before operation in this country. Diamond Alkali put its Houston, Texas, plant into operation. Both Westvaco, at Charleston, W. Va., and Dow, at Freeport, Texas, are expanding their capacity.

Chlorine's more active brother, fluorine, continues to grow in chemical prominence. The Pennsylvania Salt Mfg. Co. has opened its $2 million Calvert City, Ky., plant for the production of sulfuric and hydrofluoric acids. Enlargement of the plant has already been started. T.V.A. has started its plant to recover calcium fluoride from phosphate fumes. Although not a large plant it hopes to point the way for others. Monsanto has one already. New fluorine inorganics continue to appear, as antimony pentafluoride and boron trifluoride-phenol complex. Ozark-Mahoning, at Tulsa, Okla., is producing a series of fluophosphates, as KPF_6, K_2PO_3F, and others. Victor Chemical also produces some of these.

One alkali that will not be overproduced is magnesium oxide. If all sulfite pulp mills switch from calcium to magnesium base pulping the increased demand for magnesium oxide will call for much more production. Weyerhaeuser Timber Co., at its Longview and Everett, Wash., plants, has changed to magnesia with evaporation and recovery units. Anti-pollution groups will put pressure on other mills to do likewise.

CABBAGES AND KINGS

Industrial oxygen continues to stimulate new interest in old reactions. McCarthy Chemical Co.'s 175-tons-per-day plant went into operation this spring. Purity is 95 per cent oxygen. This plant is a babe compared to the 2,000 tons per day scheduled to go into operation in early 1950 at Brownsville, Texas, at Carthage Hydrocol. A number of other sizable plants are under construction here and abroad.

Two metals are receiving considerable attention: titanium and gallium. Titanium, one of the most abundant elements in the earth's crust, shows a remarkable combination of mechanical and corrosion-resistant properties. A great effort is being made to produce it cheaply. This will be followed by chemical utilization of its compounds. Gallium is being produced and sold by the Aluminum Co. of America. Its long liquid range from 86°F. to 3100°F. should make it useful in instruments. Chemically, it is similar to aluminum, in ores of which it occurs to an extent of about one ounce per ton of ore.

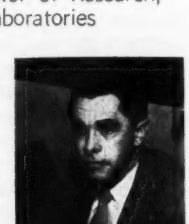
Metal Hydrides, Inc., is now supplying in research quantities lithium deuteride, LiH^2, and lithium aluminum deuteride, $LiAlH^2{}_4$. Praise Heaven, we don't have to use both subscripts and superscripts every day.

Ammonium thiocyanate has been found to be a defoliant. The local gas works can start reclaiming another inorganic.

Iron pentacarbonyl, used in Germany as an anti-knock compound, is now available as an industrial chemical in this country from General Aniline & Film Corp.

PHARMACEUTICALS

by MARLIN T. LEFFLER,
Assistant Director of Research,
Abbot Laboratories



THE PAST YEAR witnessed the introduction of a number of new pharmaceuticals which materially aided the increase in domestic, as well as foreign business. A gain of 5% over the previous year in total sales of drug and allied industries was accompanied by a record in drug exports amounting to $191 million, an increase of some 7%. Remarkable also was the growth in dollar volume of medicinal production in the United States as revealed by Bureau of Census figures showing an increase of 860% in the nine years from 1939 to 1947. Somewhat less optimistic, perhaps, are predictions for the current year, particularly in the export market, as United States manufacturers are beginning to feel the effect of both the foreign dollar famine and Europe's reviving drug industry. The general trend in the domestic

market for the first part of 1949, however, continued on about the 1948 level. Average wholesale prices of drugs and pharmaceuticals followed the gradual but steady decline which has characterized the market for these commodities during the past year. Antibiotics still control a large share of the business, with 1948 penicillin production rising to 94 trillion units, a gain of 127% over the preceding year; streptomycin production climbed to 90,000 pounds. Together these antibiotics were responsible for well over half of the value of medicinal sales. Vitamins have remained fairly constant over three years, but sulfa drugs declined sharply in 1948, dropping to the lowest output since 1941.

NEW ANTIBIOTICS

This promising field of research bore more fruit with the introduction of several new antibiotics. Dihydrostreptomycin, apparently being a somewhat better tolerated product, has, to a significant extent, replaced streptomycin. Procaine penicillin gained a top place in production, and at least two advances were made in improved forms of administration: First, procaine penicillin incorporated in an oil medium with aluminum monostearate affords, by delayed absorption after intramuscular administration, blood levels up to 96 hours; second, procaine penicillin for aqueous suspension has, aside from giving less trouble at the site of injection, the property of higher initial blood levels sustaining up to 24 hours. Still another development of even greater interest is a new form of dust inhalation therapy with micronized penicillin permitting more effective treatment of upper and lower respiratory infections.

Chloromycetin and aureomycin brought new hope for the control of certain rickettsial and virus diseases: Typhus, Rocky Mountain spotted fever, undulant fever, virus pneumonia, and even typhoid have responded. Of much interest to the chemist was the proof of structure and successful synthesis of chloromycetin, a nitrophenyl glycol derivative, the first known example of a nitro group occurring in nature.

VITAMIN B_{12}

Intense research and development brought both the concentrate and crystalline form of vitamin B_{12} (the most active therapeutic substance known) to the market during the early part of the year. Actual production of B_{12} took an unusual but fortunate turn with the discovery of a method of making this anti-pernicious anemia factor from the mold that produces streptomycin. Recent evidence on the chemistry of B_{12} shows this compound of molecular weight 1500 to have a 1:1 cobalt phosphorus ratio, with nitrogen atoms possibly bound in a porphyrin-like structure.

TROPICAL DISEASES

For the suppression of malaria, both chloroquin and chlorguanide have largely superseded Atabrine, and just recently a third effective suppressive, Camoquin (a new chloroquinoline), entered the field. Pentaquine, given concurrently with quinine, proves to be a better curative agent for vivax malaria.

Several new antimonials hold promise for the treatment of schistosomiasis, and effective management of amebic hepatitis (liver stage of amebic dysentery) can now be achieved with chloroquin.

RADIOACTIVE ISOTOPES

Although the principal biochemical interest in radioactive isotopes still lies in their use as tracers in metabolism and in following drug action, new medical applications are coming into use. Radioactive iodine, as sodium iodide given orally, finds application not only in the treatment of thyroid cancer, but also for hyperthyroidism. Radiophosphorus injections give unusually good results for the treatment of polycythemia. By means of radioactive diiodofluorescein (and in some instances radiophosphorus) followed by triangulation with the Geiger counter, it is possible to spot exact location of brain tumors—techniques of considerable aid to the surgeon.

OTHER DEVELOPMENTS

More than a dozen antihistaminics have reached the market, with reports of newer types (several departing from the more common ethylenediamine structure) to follow before the end of 1949.

A recent headline announcement from the Mayo Clinic brought stirring news of antiarthritic activity in both Kendall's compound E (Cortisone) and ACTH (adrenocorticotropic hormone). Lack of adequate supplies will limit them to research use for some time to come, but feverish efforts are being made to improve the synthesis of Cortisone and to improve the extraction technique of ACTH from hog pituitaries.

For tuberculosis, *p*-aminosalicylic acid (first announced in Sweden) may be a useful therapeutic agent when combined with streptomycin.

Further aid for the *petit mal* epileptic will be found in paramethadione, a companion to trimethadione, and showing continued promise in the *grand mal* type is phenacetylurea. Success has also been achieved in the therapy of spastic disorders with the glycerol derivative, Myanesin.

Encouragement for continued progress of medical science is found in the estimate that the drug industry in this country is spending in the neighborhood of fifty million dollars annually for scientific research—a research budget increase of some 25% since 1945. We may look forward, then, with hope to the solution of those medical problems which still confront us today.

POLYMERS

by ROBERT B. MESROBIAN
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PROGRESS in the rapidly moving field of polymers has kept pace this last year with that established during the past two decades. In three of the branches of polymers — rubbers, plastics, and fibers—notable achievements have been recorded in both technology and development of new products. With no attempt to be complete or exhaustive, this report outlines some of the more recent, outstanding developments.

RUBBERS

The intense research in synthetic rubber chemistry carried out during the war years has reached its present peak in the development of cold rubber. The wartime standard methods for production of the classical synthetic rubbers, Buna S, Buna N and GR-S, are now being replaced by a new process of preparation involving polymerization reactions at low temperatures with the aid of novel polymerization catalysts. It had been realized for many years that the properties of synthetic rubbers could be greatly improved if the structure of the long-chain molecules were more regular and evenly spaced. Polymerization reactions at low temperatures yield this desired effect, but before the development of the cold-rubber process, the time required for low-temperature reactions was several days rather than the fifteen hours normally encountered in the standard procedure at high temperatures (122°F.). The unusual feature of the cold rubber process is the powerful catalysts (cumene or t-butyl hydroperoxide used with thioazoethers, for example) that enable polymerization reactions to be complete in 10-12 hours at 0°F. By this improved method the same starting materials are used to prepare the common synthetic rubbers as employed in the standard procedure, but now the chemical, physical and processibility properties of the rubbers produced are equal, and in some cases quite superior to natural rubber. Production of cold rubber is beyond the pilot-plant stage and, if current estimates are correct, should reach 200,000 tons by next year.

PLASTICS

There was much interest in the plastic field a short while ago when the fluorinated olefins and polyolefins such as polytetrafluoroethylene (Teflon) were first introduced. Due to the nature of their chemical constitution, these plastics exhibit phenomenal resistance against heat and chemical deterioration. Molders and users of rigid, colorless plastics will be interested in a recent modification of the above type plastic. Limited production of a new line of fluorinated polymers, notably polychlorotrifluoroethylene has begun. These materials are also inert and possess a good balance of properties like the polytetrafluorethylenes, but contain an additional feature in that they are more easily processable. Whereas improvements are forthcoming on special techniques for extruding, molding and fabricating of Teflon, the chlorotrifluoroethylene polymers are easily processed with conventional equipment designed to operate at 500-600°F. Good properties are obtained from —320° to 390°F.

Wider development of nylon or polyamide plastics is in operation. Although in the past the bulk of polyamides was used in filament and fabric production, their use is now extended to include hard materials such as gears, bearings and heat-sealing adhesives for textile piece goods in continuous processing operations. This diversity of application of the polyamides undoubtedly arises from variations in the starting monomers, which according to the kind used, may produce polymers ranging from elastic to fibrous to hard products.

FIBERS

Interest in the field of synthetic fibers has been greatly stimulated by the development of polyacrylonitrile (Orlon) and terephthalic acid-glycol (Terylene) polymers. Work on the acrylonitrile fiber began in 1940 and now a new continuous-filament fiber of great strength is available that may be used in conventional equipment for winding, braiding, dyeing, and finishing. The yarn and fabric have a wool-like character and are very resistant to mildew, moth, acid and alkali deterioration.

The terylene materials are formed by polycondensation of terephthalic acid and ethylene glycol. This type of polymer belongs in the class of polyesters. The polymer may be readily drawn to fine filaments and is a strong material with outstanding thermal properties. The good physical and chemical properties of the terylenes are due to the ability of the linear polymer chains to pack tightly into a crystal lattice, allowing strong bonding forces to come into play.

Other interesting developments have taken place among the protein fibers. Much research has been applied to the study of casein and carbamido casein fibers, and it has been found that the water resistance of casein fibers can be greatly enhanced by the introduction of carbamido groups rather than by treatment of casein with formaldehyde alone. The new carbamido casein may be extruded in the same way as casein to give single filaments or bristles. The textile fibers exhibit much better mechanical properties than either acetyl or benzoyl casein fibers. Development of a new fiber of soy bean appears to hold some promise. The soybean fiber by itself is not satisfactory from the point of view of filament strength, but blends of soybean-rayon and soybean-cotton containing 30-50% of the new fiber appear to give filaments of satisfactory strength.

NAVAL STORES

by J. M. SCHANTZ
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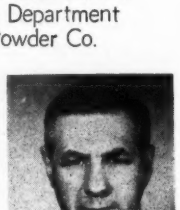
Hercules Powder Co.



THE past year saw the naval stores industry continue to broaden the field of application for its products through development of new chemicals and markets.

Commercial production of rosin amine was begun. Rosin Amine D acetate and hydrochloride have proved effective aids in floating siliceous minerals from non-metallic ores such as phosphate rock, feldspar, and mica. Some of the derivatives of Rosin Amine D have been found to be effective anticorrosion agents in pressurized water systems employed for the secondary recovery of petroleum. In the production of crude petroleum, Rosin Amine D and some of its derivatives have shown promise for breaking oil emulsions. Another indicated use for Rosin Amine D is as an additive to asphalt mastic cements where it improves adhesion to wet concrete and glass tile surfaces.

Despite substantially increased plant capacity, early in 1949, for the production of toxaphene (chlorinated camphene containing 67% to 69% chlorine) this potent agricultural insecticide was so widely used against grasshoppers, all cotton insect pests and many other insects that a supply shortage developed near the end of July, 1949.

This is only the second year in which toxaphene has been available commercially and in that short time it has assumed a place among the leading organic insecticides. Production facilities are being increased for the 1950 growing season.

The increase in production of the new synthetic cold rubber has meant an increase in the use of two other naval stores products, Dresinate 731 and cumene hydroperoxide. Dresinate 731, the sodium soap of a disproportionated rosin, is also the essential emulsifier in the preparation of GR-S-10 and the other GR-S recipes. Cumene hydroperoxide is one of the catalysts in the manufacture of cold rubber.

The use of terpenes in the production of synthetic resins continues to expand. A new resin purported to be an alpha-pinene polymer was announced recently.

There also has been a growing use of refined tall oil in the production of alkyd resins and soap as a replacement for rosin and fatty acids.

The use of terpene hydrocarbons for the preparation of oil additives, which showed a temporary slump in the early part of the year, is now expected to exceed previous years as far as consumption is concerned.

Conversion of terpene hydrocarbons to paracymene is due for a sharp increase early in 1950 when a new plant is expected to begin operation.

DYES

by BYRON L. WEST
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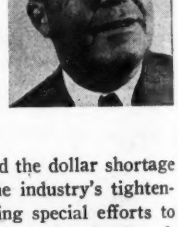


THE DYE industry caught up with demand during the past year. The backlog of consumer requirements caused by war shortages had been overcome. The consequent reduction of large textile inventories and the dollar shortage abroad resulted in the industry's tightening its belt and making special efforts to practice economy and to increase its efficiency. The industry, therefore, put increased emphasis on efforts to develop and promote sales of new products worked out in research.

NEW INSTRUMENTS

A new integrator[17] for attachment to a G.E. recording spectrophotometer has been developed and is now available which gives colorimetric values simultaneously with the spectrophotometric curves. Two samples which appear alike to the human eye may have radically different curves. To interpret these curves in terms of color it is necessary to calculate tristimulus values from them, for two samples with identical tristimulus values look alike regardless of their spectrophotometric curves. Previously, the calculation of tristimulus values was a most tedious task requiring manual addition of a number of reflectance values.

Also available for attachment to the G.E. spectrophotometer is a special opti-

cal component—a retardation plate[18]—which permits the measurement of polarizing samples such as satin weave cloth.

A special cam is now available for the first time for the G.E. spectrophotometer, which facilitates the calculation of dye concentration from reflectance measurements.[19]

A "Compensated Opal" comprising permanent reflecting and transmitting glass standards has been described[24] as an equivalent replacement for the fragile and fugitive magnesium oxide white—the universal standard of spectrophotometry.

ANTHRAQUINONE DYES

The flood of patents on new acetate dyes appears to have dried up. Two new acetate dyes worthy of comment, however, are 1-hydroxy-4-(β-trifluoroethyl) anthraquinone and 1-hydroxy-(β-difluoroethyl) anthraquinone, which are claimed to have better light- and gas-fading fastness properties than the analogs without fluorine. Water-soluble anthraquinone acetate dyes are claimed. These are esters of hydroxyalkyl thioethers of anthraquinone. An interesting feature is that some of the compounds cited contain arylamino groups in the 4-position.

A superior Saphirol-type blue wool dye is claimed to be made by N-methylation of Saphirol by means of formaldehyde and oxalic acid. The product shows less shade change when viewed in artificial light. The patent also covers the N-methylation of α-aminoanthraquinone, which evidently is quite incomplete, although any methylation of α-aminoanthraquinone is of interest. Pure blue wool dyes of high fastness and showing no shade change under artificial light are claimed which may be formed from the disulfo analog of bromamine acid with the second sulfonic group in the 6th or 7th position, by replacing the bromine by a cycloalkylamino group. Better neutral dyeing properties are claimed when the 4-arylamino groups condensed on bromamine acid contain an alkylcarboxy substituent and a sulfamide radical. Of a rather unusual class are the brown wool dyes claimed, which are prepared by acylating sulfonated 4-(*p*-phenylazoanilino)anthraquinone.

Some work which might be termed progress on anthraquinone intermediates has already been reported above. Other than that an interesting process for making aminoanthraquinone was patented where the monosulfonic acid, which may contain some of the β-isomer, is ammonolyzed by claving it at 220° in the presence of ammonium arsensate with no excess of ammonia and with a pH between 6.5 and 9.3. A yield of 98% of theory is claimed and the product is claimed to be free from the β-isomer.

Valuable new red vat dyes are claimed consisting of two α-aminoanthraquinones connected to a 1,3,4-oxy diazole ring at the 2-5-positions by the β-carbons. Bordeaux shades of excellent properties were prepared by the acylation of 5-amino-1,4-dibenzamidoanthraquinone by the 1-chloro and 1-amino derivatives of anthraquinone-2-carboxylic acid. A number of complex anthraquinone acridone-type dyes involving additional anthrimide carbazole and amide linkages have appeared in patents. The shades vary from orange to brown to gray.

Several patents cover vat dyes containing aroylamino groups in which are substituted sulfone derivatives. Valuable red dyes are claimed to be formed by putting a *p*-benzenesulfonyl group into one of the benzoyl groups of the old Vat Red 5GK. The same type of substituent is introduced into the benzoyl group of anthrimid carbazole vat dyes. The sulfone substituent is said to exert a hypsochromic effect and the product prints better than when the sulfone constituent is absent. Also, vat dyes are prepared by condensing aminoanthraquinone with an acylating component containing a sulfonamido group and the products are claimed to have improved fastness properties. The cinnamoyl derivatives of 4-aminoanthraquinone benzacridone is claimed. In contrast to the benzoyl group, the cinnamoyl group does not shift the shade of the blue product very much towards the red. New gray vat dyes are formed by chlorinating benzanthrone, condensing with α-aminoanthraquinone and performing an alcoholic alkaline fusion.

An interesting process improvement is also given wherein all sorts of anthrimides are prepared in a dry ball mill process between amino- and chloroanthraquinones, the mixtures being held 3 to 5 hours at 200 to 240°C. and no solvent being used. The yields are often quantitative. Very fine dispersions of vat dyes are obtained by stirring the dye with sulfuric acid of critical strength, specific for each dye, then drowning the formed oxonium sulfate in water. This type of treatment is becoming increasingly important as application of vat dyes by padding increases.

PRINTING ASSISTANTS

A printing assistant for vat dyes has been disclosed as prepared from a quinonyl monoamide of a dicarboxylic acid (such as α-anthraquinonyl monoamid of maleic acid) and a urea.

Two patents have issued disclosing processes comprising printing the ester salts of difficultly oxidizable sulfuric esters of the leuco of indigoid type vat dyes with dichromates in the presence of an aniline sulfonic acid radical and also in the presence of hydroxymethylnaphthalene-ω-sulfonic acids.

AZO DYES AND AZOICS

The trend is to produce faster direct dyes, particularly those fast to resin treatments such as creaseproofing. Emphasis on copperization continues not only on the dyes but in the dye-bath and on the fiber.

New coupling components include: 4,4'-diaminobenzanilide as a tetrazo component for after copperized direct browns; N,N'-dimethyl-N,N'bis(metanilamido)-*p*-phenylenediamine as tetrazo component which, coupled to 1-hydroxy-5-glycerylaminonaphthalene, produces a red acetate dye; a *p*-aminobenzoyl derivative of 5-aminosalicylic acid which, coupled to *m*-toluidine, which dye in turn diazotized and coupled to *p*-aminobenzoyl J acid, is said to produce a direct bordeaux of improved light fastness after resin treatment; 3-amino-4-hydroxybenzanilide which, when coupled to J acid derivatives and phosgenated or condensed with cyanuric acid, produce reds and violets fast to resin treatments; and finally, *tert*-amyl-2-aminophenol-6-sulfonic acid, which produces a chrome red when coupled to phenylmethylpyrazolone.

New coupling components include ketonic derivatives and sulfones of 1-naphthol-8-sulfonic acid, such as 4-methyl or *p*-phenyl ketone or 4-*p*-sulfophenylsulfone of 1-naphthol-8-sulfonic acid.

Several new stilbene azo dyes have been patented: direct yellows and reds from diaminostilbenesulfonic acid linked on one side to a triazine ring and on the other coupled to azo intermediates; copperized direct browns and olives prepared from the condensation of two stilbene molecules and from an aminoazo compound; and copperized direct browns which are unsymmetrical stilbene dyes containing on one side an aminosalicylic group and on the other aminoazo compounds.

A process has been disclosed for preparing azo pyrazolone dyes by coupling ethyl acetosuccinate and its derivatives with two molecules of a diazonium compound and by simultaneously cyclizing to the azo pyrazolone dye.

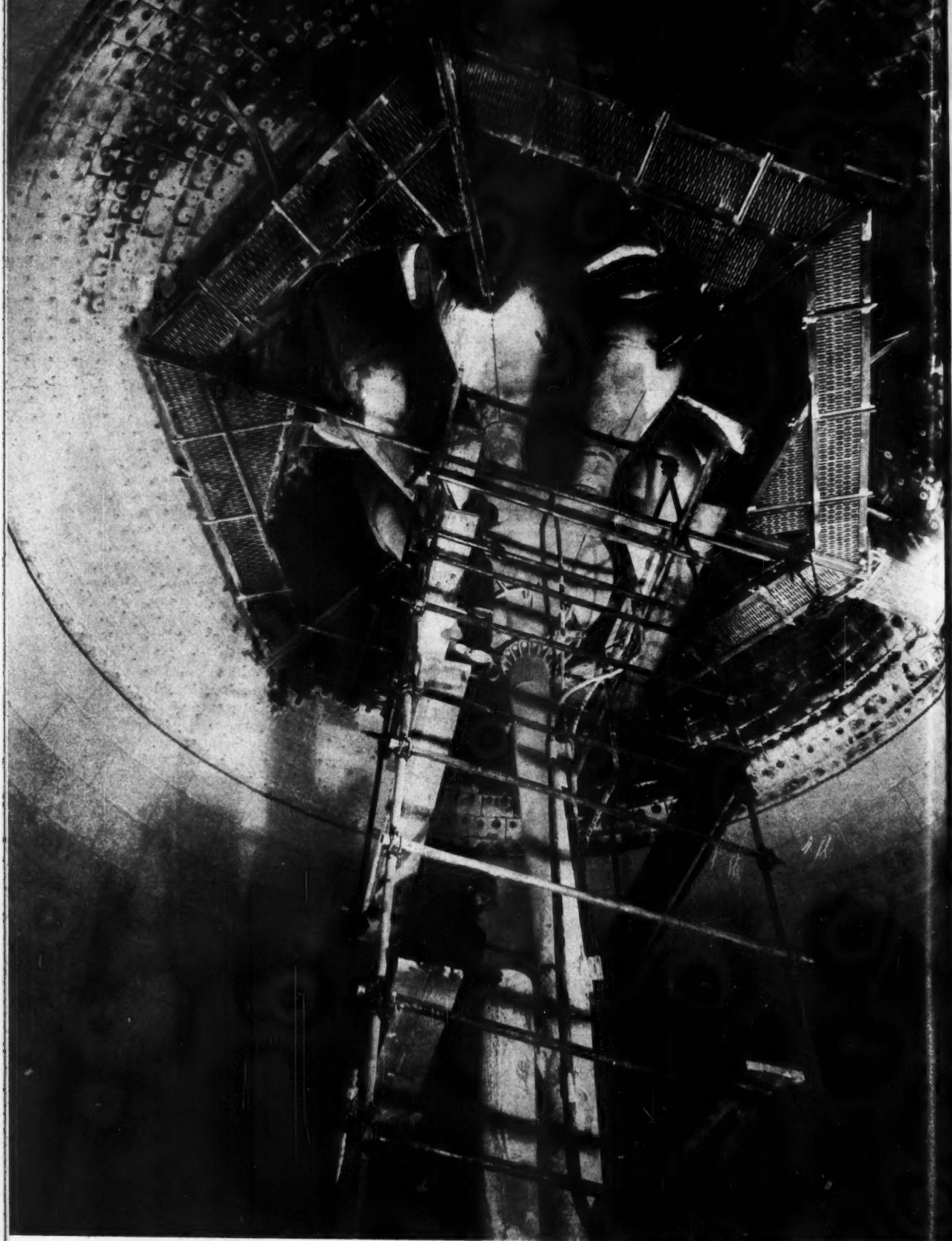
Similar to the method used in the solubilization of Alcian Blue 8GS, we find patented ternary sulfonium salts of yellow direct azo dyes. Azo(benzthiazolyl)benzene types containing thioether groups are solubilized by conversion of the thioethers to ternary sulfonium salts.

No radical innovations in the field of Fast Bases have appeared. Slight modifications in the well-known Blue Bases have been described, but appear to offer no outstanding advantages. Two new types of coupling components have been prepared: aliphatic nitro compounds which produce yellow to brown hues, and heterocyclic compounds derived from chlorosulfonylacetic acid and ureas for obtaining yellows.

PHTHALOCYANINES

Among the patents disclosing methods of preparation we find a modification of the Wyler urea process in which an oxi-

(*Turn to page 616*)



M. W. Kellogg Co.

Dust collectors for catalyst recovery inside fluid "cat" cracker at Gulf Oil Corp., Philadelphia, Pa.

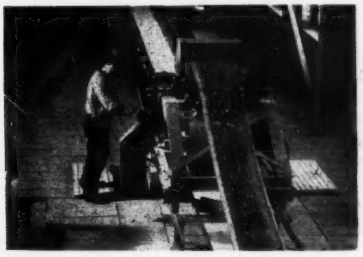
NEW PROCESS EQUIPMENT PROVIDES NEW ECONOMIES

FORWARD IN PROCESSING EQUIPMENT

• The past year has been marked primarily by a complete transition from the almost phrenetic demand for equipment of all types that characterized the War and Postwar years to a more normal pace. For a change a buyer can shop around to obtain the exact piece of equipment needed for his particular job, and while he is shopping the equipment salesman is again most happy to pick up the luncheon tab.

The ability to use the proper piece of equipment has produced not only economies in the initial cost of the plant but also in its operation. Finally there is another but more intangible economy. The sharpening of pencils now required to get the order has resulted in more attention being given by the engineer to cheaper methods of fabrication for present designs and to the development of entirely new and less costly designs, needed if the manufacturer is to maintain his competitive position.

After a short period during the summer when demand for both chemicals and equipment reached a postwar low, sales groups for equipment fabricators are again beginning to voice a little optimism as the interrupted flow of orders again begins to swell.



MATERIALS HANDLING

by ROBERT L. BOYLE
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DEVELOPMENT of new processes and refinements in process and manufacturing techniques necessitate a constant evolution in materials handling equipment. The past two years have seen the introduction of a number of design changes aimed at improvements in performance and service life or reductions in weight and cost.

Fluidized flow of solids has become increasingly important. The Airslide is a new type of conveyor utilizing this principle. It is actually a gravity conveyor fluidizing the material to be moved by passing low pressure air through the slightly inclined porous medium supporting the stream of material. Units of this type have been successfully used to feed and convey cement down a 4° slope at rates up to 225 tons per hour with horsepower requirements reportedly about 10% of that of comparable screw conveyors.

A new addition to the en masse conveying field is the Cable-Veyor which consists of regularly spaced, circular flights mounted on preformed wire cable. The standard tubing used for the casing can be turned in any direction with discharge at one or more points. A further refinement in this conveyor is the Pneumatrol, an air or hydraulic pressure seal which permits continuous travel of the flight and cable into and out of pressure and vacuum zones regardless of pressure differential. This feature should provide a solution in some cases to the ever difficult problem of feeding solid material into process equipment operating under pressure or vacuum.

Developed particularly for handling foods, grains, dry chemicals and raw materials in process industries where cleanliness and gentle handling are important, the Zipper is an entirely new type of belt conveyor. Literally a moving pipe line for bulk materials it consists of: (1) a flat, endless base belt similar to the conventional conveyor belt; (2) flexible rubber side-walls hinged to the shoulders of the base belt; and (3) interlocking rubber teeth (the zipper) molded on the outer edges of the side walls. In operation, after the belt passes the loading point, the zipper is meshed and the material, completely enclosed in the belt, may be conveyed and elevated in any plane. Where the desired discharge point is reached the teeth are separated and the belt emptied.

Another innovation in belt conveying is the use of steel in place of rubber and fabric for belt material. Although stainless and carbon steel belts have had wide use in Europe, they have been available in the United States only through import from Sweden. However, tests recently conducted on a stainless steel belt conveyor wholly produced in this country, indicate satisfactory performance handling lump coal, with initial cost considerably below that of conventional belt, and service life reportedly comparable.

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A number of developments for the loading and intermediate transport of materials have risen from the experience of the now highly mechanized coal industry and its equipment suppliers. A hard rock loader with the continuous loading principle of the Joy-patented gathering arms is now finding service in limestone and hard rock metal mines, as well as in the handling of various chemical materials. Coal-type shuttle cars, mounted either on cats or tires, have also been developed for underground, open pit and stockpiling transport operations in chemical and extractive industries (and are being considered for certain construction fields). Such shuttle cars, in combination with chain and flight conveyors, elevators and automatic loading equipment, are ushering in new trackless techniques of handling in many fields.

The development of industrial power and hand trucks for handling packaged material and pallets is closely linked to the changing needs of industry. In order to satisfy the particular demands of each user, truck manufacturers offer large numbers of accessories and attachments each aimed at specialized handling problems.

Portable conveyors utilizing lightweight metals, portable powered conveyors, telescoping conveyors, collapsible pallets, expendable pallets and many other developments are all aimed at reduction in manpower requirements and handling time or more efficient utilization of storage space. For the most part process and manufacturing industries involved in handling bulk or packaged material are now aware of the convenience and economies possible with proper handling equipment.

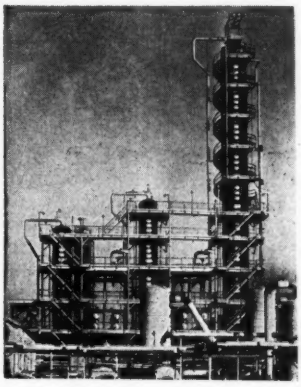
No review of materials handling as related to the broad and growing American chemical field would be complete without mention of the growth in the use of process piping. The trend towards automatic and continuous flow processing inevitably generates a greater need for piping and tubing. Piping systems are thus a growing means of transport and a complex technology is being evolved for the application of piping systems and for the development of closures, valves and automatic instrumentation required in such applications.

MATERIALS HANDLING—New Equipment Announced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*		*Company*
Adjustable-Fork Truck	6500-lb. cap		Hydraulically operated adjustable forks, battery powered hand truck, for palletless operation			Yale & Towne Mfg. Co.
Bag Flattener	24″x11; 8″ ctrs.		Two conveyors, one hinged above other, press and flatten bags up to 30″ wide for better storage			Flexoveyor Mfg Co.
Bag Piler	24″x12′ to 20′ high		Can elevate up 70° incline to height of 20′			Flexoveyor Mfg. Co.
Barrel Truck	To 55 gal. drum		Hook and spring bearing action prevents slippage. Requires one operator			Modern Equipment Co.
Barrel Truck	1200-lb. capacity	Steel, rubber tired wheels	Running gear remains on floor when truck engages barrel. One operator required. Remain upright when not in use			Nutting Truck and Caster Co.
Baskets	⅛″, ¼″, ½″, ¾″ perforations, 12″ diam. x 12″ depth, 10″x10″, 8″x8″, 6″x6″	Heavy gauge, perforated steel; ⅛″ thick, semihard pure rubber insulation	Insulated, shock-proof, baskets for dipping, pickling, and general use in submerging products in corrosive materials			Automatic Rubber Co.
Box Car Loader	20″x26′8″ std.		Flexible for operation around 90° bends	Loading 100 lb. cotton or paper bags		Flexoveyor Mfg. Co.
Clamp-Lift Fork Truck	500-lb., 1205-lb., and 1700-lb. cap.		Hydraulically operated clamp device permits clamping in horizontal plane with variable range of clamping dimensions	For drums, barrels, crates, rolls, cartons, and bales		Clark Equipment Co.
Continuous Weigher	12″ and 18″ belt width	Variety	Integral check scale	Delivering continuous stream of material or proportioning multiple materials by weight		Richardson Scale Co.
Conveyor	14″ and 18″ wide, 20′to 40′length		Flat belt type. Driven by air or water cooled engine or electric motor with protective housing. Rubber pulley lagging, cam adjusted feed end pulley	Capacity 70 and 100 tons per hour		George Haiss Mfg Co.
Conveyor	To order		Live roller type. Slight pressure of hand stops roller conveyor line. Handles boxes and cartons			Standard Conveyor Co.
Conveyor	8″ to 31½″ wide, length to order	Stainless steel belt	Water-cooled type. Coolant contacts underside of belt. Operates within air-conditioned duct	For cooling or heating variety of chemicals and food products		Sandvik Steel, Inc.
Conveyor Belt		Rayon and nylon combination	High-tension fabric belt for belt tensions to 1000 lbs. per inch			Hewitt-Robins, Inc.
Conveyor Belt	Variety	Variety of metals and alloys	Woven wire belt with up to 87% open area	For washing or spraying from above and below		Cambridge Wire Cloth Co.
Conveyor Belt	⅜″ mesh, .072″ diam.; ½″ mesh, .072″ and .092″ diam.; ¼″ mesh, .072″ and .092″ diam.	Cadmium or stainless steel wire	Large open area		Weight per square foot of load	Wire Belt Co. of America
Counter			Photoelectric counter for installation on conveyors and automatic machines. Selective counting by height and length		To 600 counts per minute, maximum counts 99,999	Photoswitch, Inc.
Diverger	Variety		Divides one line of packages into two lines by use of electric eye		Will not handle bags or sacks	Standard Conveyor Co.
Electric Hoist	¼, ½, and 1 ton cap.		For stationary, hook, or trolley mounting. Pendant rope or push button control. High starting torque totally enclosed motor. Oversize load brake with non-reversing clutch			Robbins & Meyers, Inc.
Feeder	12″ belt width and up	Rubber belting	Permits automatic variation of feed rate to suit process needs	Kilns, boilers, where constant temperature and pressure is required		Merrick Scale Mfg. Co.
Floor Conveyor	20″x10′, 15′, and 20′ lengths		Endless springs operate over grooved rolls form conveying element	Moving bags		Flexoveyor Mfg. Co.
Flow Impeller	3¼″x7½″x½″		Small plate with fabric diffuser for injecting low-pressure air into restricted points in flow process. Provides uniform flow of bulk materials from bins, hoppers, and chutes			Bin-Dicator Co.
Fork Truck	6000-lb. capacity		Gasoline-powered, fluid drive. Maximum lifting height 130″. Collapsed height 83″			Yale & Towne Mfg. Co.
Fork Truck	2000-lb. capacity		Gasoline-powered, front wheel drive, rear wheel steer	For bags, barrels, cartons, crates, individually or unitized	Requires 57″ aisle for right-angle turns	Clark Equipment Co.
Fork Truck	2000-lb. capacity		Gasoline and electric powered. Maximum lifting height 130″. Collapsed height 83″	Warehousing, car and truck loading	Requires 60″ aisle for right-angle turns	Clark Equipment Co.
Fork Truck	2000 lb.		Hydraulic lift and tilt, automatic control, electric or gasoline-operated, several hydraulic auxiliaries			Elwell-Parker Elec. Co.
Hand Truck			Stands vertically or in semi-upright position unsupported	For drums and barrels		American Pulley Co.
Magnetic Drive Fork Truck	6000- and 7000-lb. capacity		Constant mesh transmission with magnetic inductive drive	For handling operations requiring continual direction change		Clark Equipment Co.
Oscillating-Trough Conveyor	12″-48″ wide, to 100′ long		Positive-action, roller bearing, eccentric type. For cooling, drying, or conditioning when jacketed or louvered			Link Belt Co.

MATERIALS HANDLING—New Equipment Announced 1948-9 (Continued)

Type of Equipment	Sizes	Materials of Construction	Distinguishing Features	Applications and Limitations	Company
Pallet Truck	32" to 60" long		Elimination of entering rollers. Short overall length. Hand operated	For handling in close quarters	Revolvator Co.
Pneumatic Materials Handling System			Operates under lower pressure and functions as a closed, dust-tight circuit	For pellets and powdered bulk materials	Sprout, Waldron & Co.
Rotary Permanent Magnet	2¾" diam., 9⅛" to 22¼" long		Sealed in metal tube. Rotary action provides greater capacity		Multi Finish Mfg. Co.
Sacking Scale	5 to 50 lb.	Variety	Electrical, totally enclosed, explosion proof. High speed	Sacking powdered, lump, or granular materials	Richardson Scale Co.
Scale			Portable counting and weighing type. Direct reading	Capacity 1000-lb. or 200 to 1 ratio	National Scale Co.
Scale and Auger Bag Packer	50- to 200-lb.	Stainless steel	Eliminates lifting. 2-oz. accuracy	For paper or textile bags	Richardson Scale Co.
Sewing Conveyor	8' long and to order		Ball bearing, V-belt type for one-man packing and sewing	For moving bags from filling to bag closing machine	Richardson Scale Co.
Spiral Elevating Ramp	Limited heights and diam.		High speed vibration causes material to flow up and around ramp at controlled rates	110, 220, or 440 volt AC	Syntron Co.



DISTILLATION, ABSORPTION AND EXTRACTION

by JOHN A. HUFNAGEL
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Wichita, Kansas

THE last two years has been a period characterized by a rapidly changing economic situation which has been a major influence on developments. Work on distillation and its related equipment resumed a more normal pattern. It can be divided into two classes: research on tray hydraulics, vapor and liquid distribution (both in bubble tray and packed towers) which is continuing; and mechanical modifications of bubble plate design. However, the bulk of today's work is concentrated in a general review of tower and tray design. Reduction of first cost is the major consideration. In this latter field a number of large engineering companies have, so to speak, scrapped preconceived ideas and plunged into a major development problem seeking new light on tray and tower design with the hope of building smaller towers and a better knowledge of their operation. Improvements in mechanical design of bubble decks have resulted in stronger decks with fewer projections to interfere with fluid. The Kaskade tray, first reported in 1947, is being used more widely. Liquid distribution in packed towers has been carefully studied and reported. A multiple point distributor is best although redistributors are necessary.

Ideas that were once worked on only haphazardly are now being studied with renewed interest. Materials of construction are being examined more carefully for each application to find ways of making the towers cheaper and the trays last longer. Use of linings is now more common. Use of alloy clad steel is common practice. Ideas which result in a less costly vessel are being used more frequently. A very clever approach to this problem was produced by the engineers of the Shell Oil Company in a two-plate tower for a vacuum flashing unit. It is in the shape of a sphere 30 ft. in diameter. This lowered the first cost and reduced the amount of metal required for such a giant-sized tower in conventional cylindrical form. Plates were placed above and below the mid-point of the sphere.

A frequent question that has been raised is: Hasn't too much time been spent to determine the number of plates to affect a given separation, and couldn't this time be spent more valuably in finding the most economical tower? Use of carefully thought out instrumentation has been made to reduce the cost of operation and a patent has been granted on a feed analyzer to indicate the proper tower level to put in the feed for most efficient results.

Vacuum towers are being given increased attention and larger vessels are

DISTILLATION, ABSORPTION, AND EXTRACTION—New Equipment Announced 1948-9

Type of Equipment	Sizes	Materials of Construction	Distinguishing Features	Applications and Limitations	Company
Bubble Cap	½" throat, 450 #/Hr. of steam	Graphite	One-piece construction	For use with Karbate or graphite trays	National Carbon Corp.
Deodorizer	1000#, 2500#, 5000#, and 7500#/hr.	Nickel in contact with oil treated	Fully automatic, claimed 70–90% of vacuum and stripping steam	Edible oils	Girdler Corp.
Entrainment Separator	Any size and shape	Stainless steel, Monel, Ni, Cu, Al, steel, special alloys	High efficiency, low weight, low pressure drop	Vacuum stills, absorbers, scrubbers. Operating conditions determine max. vapor velocity	Otto H. York Co., Inc.
Gas Absorbers	To spec.	Redwood or Douglas fir	Corrosion-resistance	Removal of air polluting gases. Temperature	Santa Fe Tank and Tower Co.
Liquid-Liquid Extractor	Any	Steel, chrome alloys, Cu, Al, etc.	High capacity, low carryover, low tower height, and small diameter	Liquid extraction and treating	Koch Eng'r. Co., Inc.
Multi-Stage Liquid-Liquid Extractor	Custom-built	Stainless steel, Monel, Cu, steel, Pyrex, etc.	3–50 extraction stages in one column	Separation of chemicals, vitamins, heat-sensitive materials. Use with soluble materials only	Otto H. York Co., Inc.
Multi-Stage Liquid-Liquid Extractor	1", 2", 3", 4", and 6" I.D. columns	Pyrex, stainless steel, Monel	10–100 extraction stages	Separation of close-boiling, azeo-tropic non-volatile materials, structural isomers, etc. Use with soluble materials only	Otto H. York Co., Inc.
Semi-Micro Batch Still		Glass and metal	Will handle 0.5 gm. samples. Can be made available to run 12 molecular distillations at one time.		Distillation Products, Inc.
Water Still	150–1500 gph	Stainless steel or Monel	Single-, double-, or triple-effect evaporator using low-pressure steam for heating	Distilled water	F. J. Stokes Machine Co.

being built. Design of the plates in these towers has received careful attention and the trend in design is to simplify as much as possible. It can be reported here that a new and simpler design of vacuum fractionating tray will be available shortly and tests have indicated that the pressure drop through this tray will be remarkably low, of the order of magnitude of 1/10 to ½ of that found in designs currently in use.

A method of distilling gum turpentine, which can possibly be extended to other materials which have solid residues, has been reported. The tower is essentially a wetted wall column. Application of packing and baffle design to this fractionator is being studied to improve efficiency of the fractionation. A 175-ton per day oxygen plant, which recently successfully completed its test run, uses the two-tower system for separating the oxygen and nitrogen. In American oxygen plants most of the fractionators have used bubble trays with caps ranging up from thimble size. However, considerable effort has been expended on learning how to design perforated trays, once a German dominated field. This has been successful and the designs and effective operating ranges are now well known. Plant sizes of less than 1000 tons can be built with perforated plates, although in this size range the design becomes complicated due to the large liquid loading which must be handled, and it is probable that no appreciable saving in tower cost will result. In the size ranges below 500 tons per day, however, it is almost certain that the towers will be built with perforated plates. One great advantage of this type plate in the smaller sizes is its extreme simplicity and ease of construction.

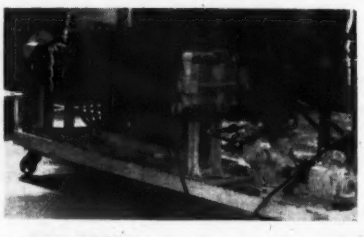
The mechanical designs worked out in this country have been patterned along the lines of the German designs, but modified to give a stronger tray and a tower which is easy and inexpensive to maintain. The liquid flows in a concentric fashion around a central cylinder and vapor bubbles through it, although some designs are based on conventional side to side liquid movement. The head of liquid on the tray, spacing and sizes of perforations, spacing of trays, and liquid gradient, all of which affect the tray design, have been worked out and from them the effective limits of any given tray have been determined. This same perforated tray can be successfully applied to fractionation of any clean material. It should be borne in mind when considering perforated trays, that a given cross sectional area of the tower will carry less vapor and liquid than a bubble tray. Consequently where height of vessel is not important the perforated plates may not be economically feasible. Where outside surface of the fractionator is to be kept to a minimum (as in an oxygen plant where heat leak is costly) each case should be studied individually.

Interest in extractive and azeotropic distillation is continuing, although not at the same level as in the period prior to 1947. A number of papers covering fundamental design data for azeotropic distillation have been reported. Research in tray design for extractive distillation is continuing since these trays operate in a range not generally considered normal for most designs. No recent work on molecular distillation has been reported.

Absorption equipment has not changed materially in the past two years, although studies of absorption in stirred vessels has been reported. A venturi atomizer to absorb salt cake fume from stack gases operates on a commercial scale. This is a simple device. Gas carrying the fumes blows into a venturi. At the vena contracta liquid is injected by pipes which are connected through the wall of the venturi, the pipes at the wall being ground smooth. High velocity of the gas rips the liquid into a fog and the resultant effect produces an intimate mixture of gas and liquid. Absorption is largely a matter of the liquid particle and fume coming in contact. This can be promoted by passing the mixture into a chamber for a predetermined time to permit more time of contact.

The field of liquid extraction and solvent refining has produced two interesting developments. The Kaskade tray, widely used for vapor-liquid contact, has been applied to liquid-liquid contacting with excellent results. Tests and commercial installations have shown it to have a throughput as much as four times that of a packed tower of the same size, with negligible carry-over. Stage efficiencies as high as 90% have been reported. Operation is almost identical with vapor-liquid contacting in the Kaskade tray. Light liquid flows up through the troughs and disperses the heavy liquid which is thrown against the tray screen, flows through, and is recontacted by light liquid.

Dr. E. G. Scheibel has perfected a new type of liquid extraction column utilizing an agitator at each stage with wire mesh above and below each agitator. This type of equipment makes it possible to obtain an equilibrium stage in about the same column height as required for a theoretical plate in conventional distilling columns. A large amount of design and operating data of liquid extraction units has become available and work is continuing on research and development in this field. A novel approach to mixing two fluids is by air agitation. Spray columns in liquid extraction in which one fluid is atomized into spheres to flow through the other continuous fluid is still being carried on with much attendant research in gas-solid fluidization as it appears that the results of these studies can be applied to liquid "fluidization".



FILTRATION

by SHELBY A. MILLER
University of Kansas
Lawrence, Kansas

ALTHOUGH no distinctly new types of process filters have appeared in the past year or two, the chemical industry has been offered a number of new models which represent either modifications of design, size, or materials of construction, or increased competitive diversification of equipment manufacturers.

Several new units of the polishing type have been placed on the market: among these are a stainless steel clarifying filter press for use with pulp sheets; a disk filter whose assembly of elements, located inside a cylindrical shell, is closed by its own hand screw, separate from the shell closure, to ensure positive seal of the filter media; and a pressure sterilizing filter, the "Sanitype," adaptable to multistage filtration in a single unit and made from polished stainless steel for easy cleaning. The use of porous stainless steel has greatly increased, and in-line filters are now available with elements of this interesting material formed into cylinders, bayonets, or stars and operable at filtering pressures up to 2,000 psi. The most recent application of porous stainless steel is in conical-disk elements with filtering surfaces on one ("Gravitain" type) or both ("Surfamax" type) faces of the disks, which may be so spaced on the filtrate manifold as to allow cakes of considerable thickness. A stainless steel "Pot-Type" filter of the vacuum-nutsche type is now available for operations lying between laboratory scale and the usual plant size; this unit has a device for clamping the medium to its support.

The most interesting new accessories are cake-removal devices, including an assembly of leaves which can be rotated past water sprays, a set of rotating, reciprocating sprays operating against stationary leaves, and an air sparger designed to loosen cake from stationary leaves. The doctor knife on panel-type

drum filters is now replaceable by a taut wire for better removal of sticky cakes.

Efforts to increase the life of both filters and media have resulted in new filters of hard rubber, of "Herculite" (a plastic to replace hard rubber and to extend its temperature threshold to 250° F. while retaining its corrosion resistance), and of porcelain and glass. They have resulted also in filter cloths of "Orlon" (polyacrylonitrile) for chemical inertness at higher temperatures, in a wider variety of nylon weaves, and in a woven wire cloth of "Hastelloy."

A novel filter medium, "Neva-Clog," has been introduced. It consists of two sheets of perforated metal so spot-welded together that the holes of one sheet are aligned opposite the unperforated portions of the other. The material is said to provide a sturdy non-plugging medium.

Several innovations have been directed toward the laboratory. They include the "Loctite" filter, a Buechner-like funnel whose side section screws to its base to clamp the medium to its support; a cylinder-type laboratory-disk clarifier; an ingenious mat which holds a filtering flash to the bench by vacuum; and an analytical grade of "Celite" filteraid.

MIXING

by E. J. LYONS,
Turbo-Mixer Corporation
Unit General American Transportation Corp., New York, N. Y.

FREE jets for large tank mixing, a novel application of the high speed disc, a larger flotation cell, and an emphasis on accessories highlight the developments in mixing equipment over the past two years. The new development in each instance lies in the method of applying the device to agitation.

The familiar mixing nozzle has been applied to many types of continuous mixing problems. A method of adapting it to the batch blending of large storage tanks has been recommended by Atwood. Nevertheless, the wartime need for mixing in large underground storage tanks in England inspired the investigation of free jets for this service by L. E. Prosser and H. Fossett of the Institution of Chemical Engineers.

Their method, reported earlier this year, is to enter a nozzle through the tank wall at a prescribed distance above the tank bottom. The jet is aimed diametrically and at a point on the liquid charge surface two-thirds of the distance across the tank. The stream convolutions resemble half of the familiar

FILTRATION—New Equipment Announced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*		*Company*
Filter Fabrics		Nylon, Orlon, Vinyon-N	Resistant to acids, alkalies and bacterial growth			Filtration Engineers, Inc.
Filter Fabrics		Orlon	Resistant to acids at high T.			Wellington-Sears Co.
Hard Rubber Disk Filter	10 to 100 disks 16″x16″ square	Hard rubber	Complete circulatory passage of hard rubber. No metallic pick-up			Ertel Eng'r. Corp.
High Pressure Filter	0.1 to 200 ft.², ¼″ to 4″ pipe size	Stainless 304 and 316	No compression or parting of filter element openings up to 10,000 psi	Filtration of highly viscous materials (greases) at 1100° F.		Micro Metallic Corp.
Lined Filter		Saran-lined pipe and fittings, rubber-lined filter and precoat tank	Rigid membrane of porous stone supports filter aid which does actual filtration		0–180° F. Particles larger than 1/10 micron	Titeflex, Inc.
Metallic Filter Medium	Stainless steel, Al, bronze, steel, etc.	Stainless steel, Al	Filter media is two sheets of metal so attached that the holes (0.045″ dia. and 120 per inch) on top block off holes on bottom	Any required form for plate-and-frame, rotary, leaf, etc.		W. S. Rockwell Co.
Micronic Filter & Water Separator	15–1500 gpm	Steel, stainless steel, brass, Al	Patented coalescing media and baffle section			Warner Lewis Co.
Plastic Filter Frame	12″x12″ frame	Herculite plastic	Higher impact strength than hard rubber	Hot acid filtration	Max. T =250° F.	Hercules Filter Corp.
Plate and Frame Filter	13¾″x13¾″	Stainless steel, Al, cast iron, bronze	Internal leak-proof ports require no rubber gaskets. Plates fitted with metallic backing screen for filter paper or asbestos pads			Cellulo Co.
Porous Metallic Filter	0.1 to 200 ft.², ¼″ to 4″ pipe size	Stainless 304 and 316, Hastelloy "B"	Rapid assembly and disassembly. Automatic operation possible	Clarification and solid collection		Micro Metallic Corp.
Porous Precious Metal Filter	Up to several sq. ins. in area	Pt, Au, Ag, Ta	Extremely high corrosion resistance	Laboratory and pilot plants	Limited in size—no fabrication	Micro Metallic Corp.
Porous Diaphragms for Filter	To order	White porcelain		Filtration of H_2O_2		U. S. Stoneware Co.
Rotary Vacuum Filter (Bird-Young)	Laboratory size up	Any metal or machinable alloy. Rubber-covered if needed	Multi-panel cylinders, cake removed by pneumatic blowback. Good discharge of thin cake	Filter for slow and free flowing solids		Bird Machine Co.
Rotary Vacuum Filter	10 ft.² of area	Type 316 stainless	Pilot plant filter can operate either as string discharge machine or scraper discharge	Interchangeable discharge makes this extremely valuable for experimental work or small-volume production		Filtration Engineers, Inc.
Self-Cleaning Filter	60–30,000 gph	Steel, bronze, stainless steel, Ni, Ni alloys, Hastelloy, Al	Motorized self-cleaning filter without opening	Water, sugar juice, vegetable oils, etc.		Sparkler Mfg. Co.
Self-Cleaning Filter	120–1000 ft.²	Steel, stainless alloys	Automatic cleaning of filter cake without opening cover	Antibiotics, sugar, heavy chemicals	Must be able to slurry out cake with water	Niagara Filter Corp.
Self-Cleaning Pressure Filter	30–1000 ft.²	Steel, bronze, stainless steel, Monel, Hastelloy, plastic or rubber-coated steel	Cleaning by jet spray without opening door or removing filter leaves	All aqueous solutions	Aqueous solutions only	Hercules Filter Corp.
Sterilizing Filter	8″x8″ and 13½″x13½″	Stainless steel	Polished surfaces, single- or multiple-pass operation	Pharmaceuticals		F. R. Hormann & Co., Inc.
Sulfur Filter	2.9 to 50 ft.	Lead-calked stainless steel	Steam-jacketed Kelly filter with stainless steel cloth filter leaves	Filtration of molten S in H_2SO_4 plants		Oliver United Filters, Inc.
Tilting Press-Type Filter	16″x16″	Bronze, Al, stainless steel	Counterbalanced for effortless tilting. One spindle for tightening	Batch or start-and-stop operation without danger of falling filter cake		Hercules Filter Corp.

clover-leaf pattern, the pattern occurring in all planes passing through the trajectory of the jet. The liquid in all portions of the tank is therefore periodically recycled to the nozzle, in addition to the external recycled stream to the jet pump. No comparison is made with the more common sige-entering propeller blenders.

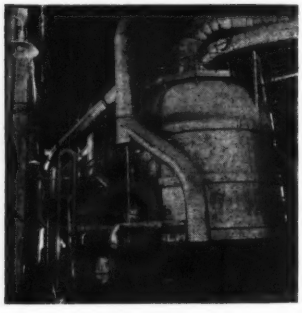
Following their successful use in the underground tanks, several installations have been completed on the Continent for blending in large gasoline and oil tanks.

A new means of disintegrating and dispersing fibrous slurries such as paper stock and waste paper, all in one operation, is claimed for the Dynopulper marketed by the Rice Barton Research Corporation. Saucer-like circulators, similar to those of the Cornell blender, are mounted on horizontal shafts at each end of a horizontal dished end tank. They rotate in opposite directions and discharge a swirling peripheral stream along the tank shell which returns on the tank axis.

The annular surfaces of the outer halves of the discs are provided with a carbide surface for abrasion resistance. Use of the discs permits the handling of fairly dense slurries. The slurry density aids the shredding action of the abrasive surface.

A new design of Turbo-Floater was placed in service during the past year. This Turbo-Mixer is especially developed for the flotation of coal washery fines and can be built in unusually large sizes, eliminating the need for multiple banks of cells to handle the washery output. It is a sub-air unit and has rake type skimmers for greater capacity.

Improvements in mixer accessories have again been emphasized. A few new drive designs are now available, as well as further improvements in stuffing box and steady bearing construction. The trend in drive support construction is toward a more frequent use of the factory-assembled nozzle mounting frame for turbine type agitators. It is supplied by most mixer manufacturers.



EVAPORATION

by W. D. KOHLINS

Buflovak Equipment Division
Blaw-Knox Company
New York, New York

PERHAPS the most widely recognized development in evaporation during the past two years has been the combination of low temperature operation and vapor recompression, which has been used for the concentration of fruit juices, particularly orange and grape to be sold in the frozen state. The wide acceptance by the public of these products has led to rapid and extensive development of evaporators that operate with liquor temperatures of from 45-60° F in the last effect. To keep operating costs to a minimum under these

EVAPORATORS—New Equipment Introduced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*	*Company*
Low Temperature Evaporator		Stainless and stainless clad	Concentrate heat sensitive materials at temperatures as low as 58° F.		Buflovak Equipment Div., Blaw-Knox Co.

MIXERS—New Equipment Announced 1948-9

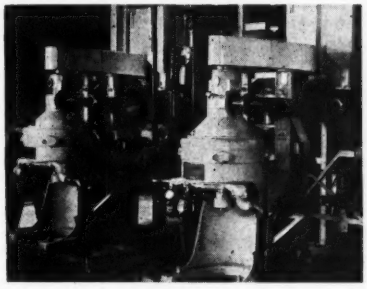
Type of Equipment	*Sizes*	*Material of Construction*	*Distinguishing Features*	*Applications and Limitations*		*Company*
Agitator			Goldman type. Shaft to mixing blade has hollow axis which functions as a draft tube			Engr. and Constr. Div., Koppers Co
Agitator	1–50 hp	Steel, stainless steel, etc.	Variable speed, down to 15 rpm	Batch processing		Emerson-Scheuring Mfg. Co
Agitator Drive	1 to 100 hp	Steel, stainless steels, Hastelloys, etc.	Packaged drive for top or bottom entering turbine impellers and paddles for open or closed tanks and variable speed drives. Simple shaft, drive design isolates flexures from gearing	Fluid mixing, suspension of solids, dispersion of gases, etc.		Mixing Equipment Co.
Agitator Drive	2–50 hp, 15 to 500 rpm	Stainless steel, Ni, steel	Accessible rotary seal parts	Autoclaves and pressure vessels	Max. P = 1000 psi	Struthers-Wells Corp.
Continuous Solids Mixer		Steel, stainless and other alloys	High speed mixer. Can handle dry, plastic or wet materials		No particles above ¾" dia.	Read Mach'y Div. of Standard Stoker Co.
Dissolver	2–40 gals. 4", 6" or 8" impellers		For use in containers brought to machine. Propeller tilts into or out of tank as desired			Cowles Co., Inc.
Drum Mixer	1, 5, 15, 30 and 55 gal. drums	Iron and steel, neoprene tires	Portable carriage rotates many sizes of drums for mixing	Mixing and drum cleaning	Loads not over 750 lb.	Morse Mfg. Co. Inc.
Dry Mixer	10, 20, 30, 50, 75, and 100 ft.³	Steel, alloy-clad or solid alloy	V-shaped vessel rotating on trunnions combines folding, rolling, and separating to produce a uniform mix	Mixing powdered material	or granulated dry	Patterson-Kelley Co.
Homogenizer	25 gph	Stainless steel	Portable, 3500 psi	Laboratory		Colloid Equipment Co.
Homogenizer	45, 50, and 150 gph	Stainless steel	Portable or for continuous operation. 3000 psi		Cannot handle liquids with solid particles	Colloid Equipment Co.
Homogenizer			Three-plunger pump pushes fluid through valves at a rate approaching sonic velocity. Can handle abrasive materials at 8000 psi			Manton Gaulin Mfg. Co.
Mixing Tank	5–250 gals	Stainless steel, Monel, Ni	"Push - Pull" propellers, all-welded tank, fast-draining sloping bottom; side outlet nipples	Mixing, blending, or suspending liquids		Alsop Eng'r. Co.
Paste Mixer	16, 25, 50 and 90 gals	Cast steel, stainless steel	Explosion-proof motor, hydraulic unit to raise or lower blades, planetary action stirrers	Mixing pastes and granular solids	Will not mix lumpy solids	Chas. Ross & Son Co.
Paste Mixer		Stainless steel	Two sets of oppositely rotating blades in cover break up heavy masses and prevent adherence to wall. Curved, radial-ribbed mixing dish rotates at 600 rpm at bottom			Abbe Eng'r. Co.
Side-Entering Mixer	½–30 hp	Steel, stainless steel, Monel, Ni, Bronze, etc.	Longer bearing span, no thrust on bearings	Suspensions, gasoline blending, paint mfr.		International Eng'r., Inc.

conditions various means of heat recovery have been put into operation. Steam jet vapor recompression with multiple effect units, straight mechanical recompression with centrifugal compressors and use of the heat pump principle with an ammonia refrigeration system have all been successfully developed. The choice of the best system is governed by local conditions of cost and availability of utilities.

Further development has taken place in the application of evaporation to waste disposal problems. Heretofore evaporation had been widely used where valuable products could be recovered from waste liquors, but where the end product was valueless and the quantities of water to be evaporated were large, evaporation was considered too costly. Here again, however, the principle of heat recovery has been put to effective use. One effective application has been to use the evaporator as a low pressure steam generator. Where low pressure steam is used in the plant and only higher pressure steam generated, then the evaporator acts as an efficient reducing valve yielding concentrated waste liquor and low pressure steam. Other similar applications have been developed.

A newly designed type of salting-out evaporator has been developed which is reported to produce a predetermined closely sized crystal. An additional development along this same line has been the incorporation into a single vessel of evaporator body and salt separator. This has resulted in substantial savings in first cost and space.

New applications of evaporators as well as the extension of their use in certain industries has taken place during the past two years. One of the outstanding evaporators that was installed was in the new synthetic glycerine plant. Further work has also been done on recovering the values in fish solubles and various evaporator designs have been installed for the several processes being used. There is more thought being given to the overall economics of all evaporator installations with greater heat recuperation as well as more effective use of heating surface distributed between evaporators and heat exchangers.



CENTRIFUGES

by JULIAN C. SMITH
Cornell University
Ithaca, N. Y.

THE past two years have seen mechanical improvements ranging from small changes to complete redesigns of several machines. Novel applications of centrifugal separators have improved the economy of many old-line processes and formed the basis for several new ones.

Mechanical improvements to high-speed centrifuges include a method of discharging very viscous fluids from the Sharples Supercentrifuge, and a complete redesign of the Sharples "Nozljector." Improved discharge covers contribute largely to the greatly increased effectiveness of this nozzle-discharge machine. A nozzle-discharge centrifuge with internal recirculation is now supplied by the Sharples Corporation. Small (3- to 10-gallon) Merco nozzle centrifuges are now available. DeLaval announces a larger "Uni-Matic" oil purifier, which will handle up to 550 gallons per hour of lubricating oil.

Easily removable baskets for underdriven batch centrifugals are available from Fletcher Works. Most of the other improvements in batch centrifugals deal with drives and speed control; the Bird "Rev-Selector" permits selection of a number of charging and discharging speeds; Fletcher Works now supplies variable-speed AC motors; and Tolhurst has announced a hydraulic drive for varying the speed of pilot-plant machines. For sugar machines, Hepworth Machine Co., Inc., provides automatic sliding covers to minimize loss of hot wash water and to protect the operator. Fully automatic machines have been installed in one sugar refinery. An 18-inch automatic batch machine, with a hinged front for easy access, is now supplied by Baker Perkins, Inc.

A new continuous centrifuge, the cylindrical Super-D-Canter, is announced by the Sharples Corporation. It is a conveyor centrifuge with a cylindrical rotor; a special conveyor extrudes the solids through ports in the end plate instead of in the wall of the bowl, as in previous machines. Since the solids are under the liquid at all times, this machine will dewater materials that cannot be handled in other conveyor centrifuges. It is especially good for proteinaceous materials such as soya beans. The Baker Perkins ter Meer continuous centrifuge has been completely redesigned. Almost all parts have been improved; a new size (32-inch) has been added; and the rated capacity of the machines has been more than doubled.

In a number of process steps centrifuges have replaced other types of separators to considerable advantage, and at least one new process depends on centrifuges for its success. Continuous conveyor centrifuges are now used in removing salt from KCl in the treatment of sylvinite at Carlsbad; in separating salt in the manufacture of synthetic glycerine; and in the new continuous Chrome Yellow process. In a few cases continuous and automatic batch centrifuges have proven economical where the production rate is exceedingly low, as in the manufacture of a pharmaceutical product, and in the degritting of a pigment with an output of solid grit of less than 50 lb. per hour.

Starch tables for the separation of starch from gluten have been made obsolete by Merco nozzle centrifuges. These machines are widely used on corn and wheat starch, and tests on tapioca starch are promising. Potato starch is separated from protein water by conveyor centrifuges. Merco machines are also used for removing grit from pineapple juice. Nozzle-discharge and conveyor centrifuges are used in combination in the manufacture of fish solubles concentrate and in

CENTRIFUGES—New Equipment Announced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*		*Company*
Centrifuge	12″	Stainless steel	3250 rpm, producing centrifugal force 1750 times gravity	Laboratory use		Fletcher Works, Inc.
Continuous Centrifuge	Merco X-160, 21″ O.D. rotor	Stainless steel rotor	High speed, high gravity clarifier and concentrator	Clarification, slurry concentration, washing precipitates	Feed must be slurry. Concentrate must flow under pressure	Merco Centrifugal Co.
Ultracentrifuge	Laboratory		Precise speed control, compact optical system, automatic photography	Study of high polymers and proteins.		Specialized Instruments Corp.
Variable speed centrifuge	20″, 24″ and 30″	Stainless steel, Monel steel, rubber-coated	200–1700 rpm, self-contained	Pilot plant or research laboratory		Fletcher Works, Inc.

the processing of whale oil. The Sharples continuous soap process uses batteries of special Supercentrifuges for separating soap and lye.

In special fields of application some improvements have been made. In sugar processing the use of superheated wash water is becoming standard practice. The Western States system of heating the massecuite prior to spinning has been shown to increase the capacity of the centrifugals as much as 50%. The impregnation of braiding cotton for cables is now done centrifugally, in equipment supplied by the Leon J. Barrett Co.

DRYING

by ALEXANDER REDNISS
Technical Enterprises, Inc.
New York, New York

THE progress in drying throughout the past biennium has been confined almost exclusively to refinements in present types. New entrants into production of drying equipment have been very few. Drying rates still cannot be calculated for a particular material without pilot plant tests and then it is different for each particular type of dryer. The process engineer still must design only from test data and not from established theory. The scientific basis of drying is still badly in need of fundamental research.

Use of continuous and batch atmospheric cabinet drying has been extended into the plastics field and larger sizes are available. However, there were few design changes of a fundamental nature. Infra red heating has been applied less than anticipated two years ago. The high cost of infra red as a source of heat per pound of evaporation, and maintenance are perhaps basic reasons for its limited use.

Vacuum drying is receiving the greatest amount of research. This method, which came to the fore in blood plasma and penicillin projects during the war, shows great promise in drying of very heat sensitive materials.

One manufacturer of vacuum drum dryers has reported a redesign of construction details to operate in the 2,000-5,000 micron range with minimal air leakage. Tests are still being conducted on a variety of fruit juices and pharmaceuticals. It is reported that a small unit has been successfully applied to dry one of the newer antibiotics. This is being accomplished by important details such as internal and external diaphragm shaft seals, water cooled motors which can operate in a high vacuum, bellows and diaphragm valves, newer methods of condensation of water vapor evolved.

A manufacturer of high vacuum drying equipment in New England has successfully dried soluble coffee on a moving belt dryer under high vacuum. In this case the steam heated stainless plate belt moves inside of a vacuum chamber and the under surface of the belt moves over hot steam

DRYERS AND HUMIDIFIERS—New Equipment Announced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*	*Company*
After cooler			Protects against freezing by thermostat control of circulating air, permitting outdoor installations. No cooling tower	Dehydrates compressed air or gas and prevents further condensation in lines	Niagara Blower Co.
Atomizer	6 tph, wet	Stainless steel atomizing wheel and feed pipe	Variable speed range up to 20,000 rpm and power ratings to 60 hp	Furnished with spray drying installations	Bowen Engineering, Inc.
Compressed air dryer	15 cfm to 750 cfm (stp) at 100 psi and 70° F		Electrically (open or explosion-proof) or steam operated	Operating pressure 30 to 150 psi. Inlet temperature 40° to 120° F. Final exit dew point to −60° F	Anders Co.
Drum dryer		Welded steel frames and knife assembly, alloy drum	Adjustable angle and pressure of doctor knife, double drums speeds are variable by mechanical and electronic control,	adaptable for various production uses	F. J. Stokes Machine Co.
Drum dryer and flaker	2′ diam. by 2′ face	Variety	Double drum dryer or flaker, permits individual operation of drums, top or bottom feed, cooling or heating of drum, 24:1 speed range, and reversible drive.		F. J. Stokes Machine Co.
Dryer			Fully automatic reactivation cooling, and reversal of dual adsorber towers	Drying instrument air — Up to 150 psig for steam or electric reactivation	Pittsburg Lectrodryer Corp.
Electric furnace			Insulated door divided into upper and lower section allows partial exposure of heating chamber to minimize heat loss	Continuous operation to 1650° F. Intermittent operation to 1900° F	Thermo Electric Mfg. Co.
Electric kiln	5″x5″x5½″ to 12″x12″x12″, Special sizes		Recessed elements for free spreading of heat and simplified replacement	800 firing hours to 1900° F. Laboratory, production, and experimental uses	Rogers Electric Kilns
Extruder	To 8′	Stainless or other metals	Minimum compaction of material due to wiping action. Infinitely adjustable pressure ram	Preforming of chemical filter cake for tray or conveyor or dryer loading	National Drying Machinery Co.
Freeze dryer	12 ft.³		One compressor for pre-freezing and condensation. Requires no dry ice or desiccant	Handles product in bulk and containers — For research and development scale	F. J. Stokes Machine Co.
Fusion oven	10′x10′x17′ Web travel 35′	Insulated steel panel	Recirculating system provides uniform temperature distribution. Gas or electric heating	Curing organosol coatings — Production speed 10 to 30 yds. per min.	Gehnrich & Gehnrich, Inc.
Spray dryer	5 to 10 T per day	Mild or stainless steel	Complete operable unit equipped for fully automatic operation	Direct or indirect heaters, single or multiple-stage dry and wet collection, out-of-door installation — Floor area 12′x20′	Bowen Engineering, Inc.
Spray dryer			Danish-designed high-speed rotary atomizer head ejects mist into circulating hot air, yielding uniform powder at low drying temperatures		Nitro Corp.
Spray dryer		Stainless steel ducts	Operating air temperatures to 750° F	Handles viscous solutions and slurries — Laboratory scale and small lot	Bowen Engineering, Inc.
Turbo dryer		Steel and transite, aluminum, stainless	Tray-to-tray, continuous, uniform, and dustless operation. Variable air velocity, steam or electrically heated	Granular material, pastes, and slurries. 1M to 10M lbs. dried material per day	Wyssmont Co.
Vacuum dryer, drum	2-220 ft.³		Double-drum type permits high vacuum for heat sensitive liquids		Buflovak Equipment Div.
Vacuum dryer, rotary	1-600 ft.³		Spiral type agitators permits improved mixing and maximum discharge. Heated agitator arms, shaft, and shell for more heating surface		F. J. Stokes Machine Co.

coils. The feed is sprayed on the upper surface of the belt and the dry material is removed from the return pass of the belt by scraper knife.

Another company has been working intensively along similar lines, but has not announced details of their product.

The development of absorption of water vapors at pressures under 5 mm. in such materials as lithium chloride, promises to reduce capital investment and operating cost over present freezing condensers.

The rotary vacuum dryer has been supplanted in a few interesting cases by jacketed kettle drying with scraper agitator. Newer designs in this direction will prove of interest in drug stills and drying smaller amounts of mildly heat sensitive materials.

Spray drying has progressed somewhat in techniques and equipment, rather than in scientific understanding of basic principles. New designs have been made using higher air temperatures. One large organization has recently brought out a semi-packaged spray dryer of about 750 pounds of evaporation per hour capacity, which has had good reception in drying dairy products.

Another very large producer will begin to intensively market still smaller packaged steam-heated units—125 and 350 pounds of evaporation per hour as well as 550 and larger. The need for smaller spray dryers between the laboratory and the 500 or 1,000 pound per hour size has been felt for some years in foods, drugs, and chemical specialties production.

A new entry has been added to the rapidly expanding field of fodder drying by pneumatic conveying in a hot air stream through hot metal ducts. This is a parallel flow operation over a series of baffles which tend to separate the dry from the wet material. One of the greater advantages appears to be less overheating and smaller fire hazard.

Rotary kiln and steam tube dryers have not been improved to any major extent. The successful application of the direct contact louvre type dryer to sugar production was accomplished with great savings in heat cost and protection of crystals against excessive disintegration. Another organization has developed really tight seals on feed and discharge ends of a steam tube dryer which has been an urgent need for sometime. Two of the latter are being constructed and will soon be in use on organic materials—they are 6′0″ x 35′ and 4′6″ x 30′ respectively.

In adsorptive drying a new air conditioning unit to maintain as low as 10% relative humidity on the Navy's "Mothball Fleet" is completely automatic and requires no service except electrical power.

DUST COLLECTORS

by J. J. MURPHY

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New York, New York

IN addition to refinements that are continually being made to improve the performance of conventional dust collection equipment, two relatively new possibilities, porous metal filters and sonic agglomeration, have appeared.

Filter units made by forming and welding sintered powdered metal sheets of various grades are now available in stainless steel, type 304, and can also be supplied in other alloys for special applications. They have good mechanical strength and use of stainless steel provides needed high temperature strength, oxidation resistance and general corrosion resistance. Filter units (35 micron average pore opening) have performed well in pilot plant operations separating fluid catalyst dust (60% below 10 micron size) from high temperature process gas and in at least one commercial unit separating powdered carbon from 1350° F. gas. 100% dust filtration is accomplished. No plugging has been reported but more commercial experience is needed, particularly if there is a possibility of coking or mild corrosion.

Filters can handle about 20 to 30 cu. ft. per min. of air per sq. ft. of surface at atmospheric conditions but are costly, hence applications will be limited to the recovery of valuable catalyst dust or where process benefits justify 100% dust recovery. Filters must be cleaned periodically when the pressure drop through the collected layer reaches the design value. Cleaning can be accomplished by blowing back with air or process gas or by acid or caustic washing. For continuous processes several filter banks can be installed and provided with an automatic valving arrangement for periodic blow-back of one chamber at a time.

Fine dust particles in a gas stream, particularly those smaller than 10 microns, are being successfully agglomerated by sound waves of high intensity to form particles of about 15 micron size suitable for recovery in cyclones. The powerful ultrasonic waves cause the light particles to vibrate widely and collide with each other to form the large particles. Very little agglomeration of particles larger than 10 microns occurs. Experience and tests indicate that agglomerated particles do not again break up.

Fines of any chemical, physical or electrical nature may be recovered and successful commercial applications have already been made for the collection of carbon black, sulphuric acid fumes and soda ash dust and have proved economical both in initial cost and maintenance. A typical application consists of a sonic generator installed in a chamber in which the acoustic field is set up and agglomeration accomplished, followed by conventional cyclone collectors. The sonic generator is a highly refined version of a bicycle siren and is driven by compressed air or process

DUST SEPARATION—New Equipment Announced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*	*Company*
Dust Collector	To spec.	Redwood or Douglas fir	Corrosion resistance	Recovery of air; Temperature: polluting dusts	Santa Fe Tank and Tower Co.
Electronic Air Filter		Paper	Paper is electrostatically charged, functioning as a mechanical filter as well	For use where mechanical filtration is insufficient and cost of electronic precipitation too high	American Air Filter Co.
Fabric Filter	4-tube units	Cloth	Continuous automatic operation achieved by traveling "blow-back" rings discharging air through fabric in reverse direction		Day Co.
Ultrasonic Particle Separator	Laboratory to plant-scale		High intensity output, broad frequency range	Recovery of extremely fine liquid or solid particles from gas streams	Ultrasonic Corp.
Wash-Type Collector	2000–30,000 cfm.	Steel, stainless steel, Monel, Inconel	Can use two washing liquids—water followed by chemical	Odor removal	Claude B. Schneible Co.
Wash-Type Collector	2000–30,000 cfm.	Steel, stainless steel, Monel, Inconel	Four wet impingement stages	Where lower efficiency can be accepted.	Claude B. Schneible Co.

gas, its outstanding feature being its ability to convert 50 to 70% of the energy introduced as compressed gas into acoustic energy. Sonic collectors have proven successful in pilot plant operation for dust collection from hazardous gas where electrical precipitators could not be used.

Two standard sonic generators are available at present, one model for gas streams up to about 1,500 cu. ft. per min., and the other for streams up to about 50,000 cu. ft. per min. Approximate power requirements for the compressor are 5 HP and 150 HP, respectively, for process gas streams operating at about atmospheric pressure. Multiple units can, of course, be used. For dusts on which there is no operating experience or for high pressure processes a pilot installation of at least 1,000 cu. ft. per min. is recommended.

PUMPS, COMPRESSORS AND EXPANDERS

by JOSEPH F. SKELLY

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New York, New York

INTENSE development has characterized the field of rotary machines. With the easing of the postwar boom manufacturers have turned to the development of commercial process equipment embodying ideas originated in wartime research. From the aircraft field there has come a great wave of activity directed toward the perfection of a stationary direct-fired turbine prime mover. Leading manufacturers have full scale development models in manufacture and field tests. They are prepared to offer such designs for general commercial application on a cost sharing basis with the customer. Until such time as the field tests are finished, they are naturally unwilling to guarantee either price or performance.

This development has extended to the centrifugal gas compressor which has been placed in booster service on many large pipe lines, notably the "Big Inch." Fixed price, guaranteed proposals for units rated at several thousand horsepower are now offered.

Successful operation of the first tonnage oxygen plant signals large scale development of the low temperature expansion turbine, another outgrowth of wartime research.

In the field of centrifugal pumps it has been established that the use of the vertical turbine type offers certain important advantages over the more familiar horizontal machines. Since the casing of the vertical pumps is filled with liquid, the vessels from which these pumps take suction may often be placed at ground level, while still meeting the requirements for net pump suction head. This produces substantial economies in structure and piping costs to offset the higher initial

PUMPS, COMPRESSORS, AND EXPANDERS—New Equipment Announced 1948-9

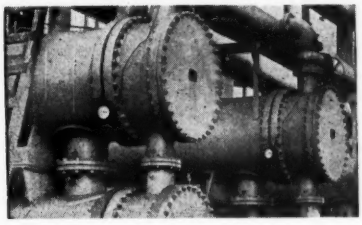
Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*		*Company*
Air Pump	5, 10, 15, and 20 cfm	Iron and steel	Direct non-lubricated consumable fan at 1750 rpm	Oil-free air	No abrasive dust in air	Kraissl Co.
Air-Driven Pump	Up to 23 gph at 115–9500 psi	Iron, steel, alloys, plastics	Air-driven rotary meter pumps		Size	Milton-Roy Co.
Axial Flow Pump		Impellers 25–12 stainless shafts 18-8	High volume applications	Sea-water pumping		Economy Pumps, Inc.
Axial and Mixed Flow Pump	Up to 100,000 gpm	Cast iron, steel, alloys	"Pull-Out" model. All working parts are removable without breaking discharge connections			Economy Pumps, Inc.
Blower	80–6000 cfm at 4 oz. to 2 psi	Welded steel	Low noise level. For use where steady non-pulsating flow is required			Chicago Blower Corp.
Centrifugal Fan	23 sizes ranging from 1'–9' in dia., 480,000 cfm		Back-tilted impeller blades			Sturtevant Div. Westinghouse Elec. Corp.
Centrifugal Pump	Up to 4000 gpm	Iron, bronze	Right- or left-hand pumps. Rotary seals eliminate need of stuffing box	Circulation of water and other non-lubricating liquids against a moderate head	Action of material being pumped on seal	Kraissl Co.
Centrifugal Pump	⅛ to ½ hp	Al or bronze	Mechanical rotary seal, 1725 rpm			Eastern Industries, Inc.
Centrifugal Pump	10–2500 gpm	Iron, bronze-fitted bronze	Self-priming, close-coupled or flexible coupling		Max. viscosity = 8000 SSU	Bowser & Co
Diffusion Pump	4", 10" and 16" casing	Steel	Higher pumping speeds for air and H_2 with ultimate P of $5x10^{-7}$ mm. Hg	Any high vacuum system	Forepressure <0.120 mm. Hg	Distillation Products, Inc
Ejector Pump	1½", 2", and 3"	Steel, bronze, stainless steel	High suction lift	Pumping solid-bearing liquids	Requires air under pressure	Schutte & Koerting Co.
Gearless Pump	1–12 gpm	Bronze, stainless steel	Dual eccentric piston provides strong flow against pressure		100 psi and 2400 rpm	Eco Eng'r. Co.
Jacketed Rotary Pump	90, 200, 300 and 450 rpm	All iron, steel-fitted, bronze-fitted	Complete jacketing for heating or cooling	Handling viscous liquids requiring heating for flowability		Viking Pump Co.
Metering Pump		Fe, steel, alloys, plastics	Multi-cylinder metering pumps. Up to 10 streams from a single "Gang" pump	Continuous formulating, ratioing, several streams. Max. P = 20,000 psi		Milton-Roy Co.
Metering Pump	250 ml. to 7 gph	Fe, steel, alloys, plastics	Duplex piston-type pump delivers constant flow without pulsation	Pilot plant and production	Max. P = 20,000 psi	Milton Roy Co.
Micro-Feeder	100 and 200 cc.	316 stainless steel	Smooth, continuous feed, sanitary construction	Laboratory and special plant applications		%Proportioneers, Inc. %
Paper Stock Pump	8-capacities from 175 to 8000 rpm. Heads up to 140'	Cast iron alloy, bronze, stainless steel and stainless steel-fitted	Only four working parts, heavy construction, rotating assembly can be removed without disturbing piping	High consistence pulp. Up to 8% when used with Hi-Density feeder		Allis-Chalmers Mfg. Co.
Positive Displacement Pumps	5 sizes up to 100 gpm	"Waukesha metal" (Ni alloy), 304 and 317 stainless steel	Vented cover, threaded, Teflon seals, easily disassembled for cleaning	Transferring light and viscous products	Max. P = 100 psi	Waukesha Foundry Co.
Rotary Pump		Vanes of non-metallic material	Sliding vane type. Vanes actuated by push rods through rotor and shaft	Both high- and low-viscosity liquids		Blackmer Pump Co.
Rubber Impeller Pump	⅜", 1", 1½"	Stainless steel with neoprene impeller	Ball bearings, mechanical seals	Liquid circulating and transfer	Max. T = 160° F. No rubber or neoprene solvents	Jabsco Pump Co.
Rotating Plunger Type Vacuum Pump	About 4½ cfm at 15' of vacuum		Eccentrically mounted rotor		Max. vacuum = 28½"	Rite-Way Products Co.

cost of the pumps. There is also a general trend toward elimination of pump houses and outdoor installation of all pumps, except in the coldest climates.

A novel rotary pump has recently been placed on the market. In this machine the clearances between the moving parts in the pump fluid are fixed through a gearing system, so that there is no actual contact between the parts immersed in the fluid. This eliminates wear and makes it possible to raise non-lubricating liquids to relatively high pressures without fear of rotor wear.

Another ingenious unit combines an ejector with a centrifugal pump, so that very small quantities of liquid may be pumped to high pressures. This marks the introduction of what is basically a centrifugal pump into a field formerly restricted to rotary and reciprocating machines.

A new solution to the problem of cylinder clearance has been developed for the reciprocating gas compressor. Variable clearance pockets have been located in the compressor pistons, and it is claimed that this arrangement offers marked advantages over the more familiar pockets attached to the cylinder.



HEAT EXCHANGE

by P. S. OTTEN

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New York, New York

THE past six to nine months in the heat exchange field has been marked primarily by a major change in the price trends. This is the first time that equipment prices have dropped appreciably in the past decade.

It is probable that these prices are now about as low as they will go and the recent increases in the metal markets will probably be reflected in increased prices although it is doubtful that they will climb to the peaks of '47 and '48.

During the early postwar period, the emphasis was on production, now stiff competition and a buyers market coupled with a production slack-off has caused many equipment manufacturers to redesign their standard lines for less expensive construction and to develop new exchangers, many of these are designed for the use of finned surface in place of regular tubing.

Shipment time for standard units has dropped from sixteen weeks to eight to ten weeks and the mass production items can now be obtained in two to four weeks. Specially designed units for unusual duties or with special materials can be obtained in twelve to sixteen weeks, depending mostly upon the availability of the materials.

PUMPS, COMPRESSORS, AND EXPANDERS—New Equipment Announced 1948-9 (Continued)

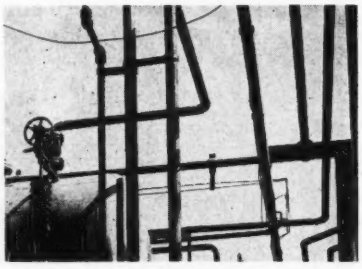
Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*		*Company*
Sanitary Pump	17, 35, 50, 92 gpm	Nickel-silver, stainless steel	"O" ring seal	All types of liquids under sanitary conditions		Viking Pump Co.
Steam Turbine	5–1500 hp. Steam at 600 psig and 750° F		16", 20", and 25" wheel size. Many parts are interchangeable between wheel sizes	All-weather, general purpose turbine		Westinghouse Elec. Co.
Syphons and Eductors	½"–3"	Stainless steel		Pumping corrosive liquids	Requires steam or water under P to operate	Schutte & Koerting Co.
Triplex Plunger Pump	1–7.5 gpm. Up to 6000 psi	Stainless steel- or bronze-fitted, stainless steel	Easy access for maintenance	High pressure operation		John Bean Div. Food Machinery & Chem. Corp.
Tri-Rotor Pump	80, 90, 100 gpm	Iron or bronze-fitted		Solvents and similar fluids		Yale & Towne Mfg. Co.
Turbine Type Pump	150 gpm	Bronze, stainless steel	3600 rpm, single multi-vaned impeller develops high pressure in single stage	Handles hot liquids without vapor binding	175 psi, 550 SSU	Roy E. Roth Co.
Turbine Type Pump	8 gpm	Bronze with stainless steel shaft	2200 rpm, single multi-vaned impeller develops high pressure in single stage	Handle condensate without vapor binding	80 psi	Roy E. Roth Co.
Turbine Type Pump	2–10 gpm		3450 rpm	Handle low-viscosity, non-abrasive fluids	Head of 200' of water	Roy E. Roth Co.

HEAT EXCHANGE—New Equipment Announced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*		*Company*
Cooling Tower	20–750 tons refrigeration	Wood, steel, asbestos-board casings	Balanced spray system, nailless redwood filling	Process cooling	Size	Marley Co., Inc.
Dry Cooler	All	Wood, steel, asbestos-board casings	Finned tube surface, induced or forced draft	Process cooling		Marley Co., Inc.
Heat Exchanger	10 gpm up	Cu, Monel, stainless steel, etc.	Stainless clad frames. Surfaces easily cleaned	Liquid food products		Enzinger-Union Co.
Heat Exchanger	1.04 ft.² to 35.8 ft.²	"Nocordal" impervious graphite	Heating and cooling corrosive solutions			Heil Process Equipment Co.
Immersion Heat Exchanger	2–1½" I.D. tubes in parallel coil, up to 9' long	"Karbate"	Low head space required, resistant to thermal shock	Heating or cooling corrosive fluids in shallow tanks	30 psi, 270° F.	National Carbon Co.
Liquid Coolers	420–1640 gph. 70° F. in and —40° F. out	Cu	Bottom-connected, flooded coils	Fluids not attacking Cu		Temprite Products Corp.
Refrigeration System	Up from 10 tons of refrigeration		Fan spray cooler uses low-freezing coolant to cool air below 32° F.		P < 50 psi	Niagara Blower Co.
Shell and Tube Heat Exchanger	5 million BTU per hr. on water. 2 million on oil	Admiralty tubing, brass baffles and tube sheets, steel shell	Ease of maintenance	Low pressure cooling of non-corrosive liquids		Young Radiator Co.
Shell and Tube Heat Exchanger	7-1" tubes in parallel of 6' or 9', one- or two-pass	"Karbate" tubes, steel shell	Interchangeable single- or double-pass, easy tube replacement, resistant to thermal shock	Heating or cooling corrosive fluids	50 psi steam, 75 psi hydrostatic 340° F.	National Carbon Co.
Steam Injector	½" throat, 450#/hr. steam	"Karbate"	Corrosion resistant	Heating corrosive fluids by direct steam injection	Steam at 50 psi	National Carbon Co.

New designs have been developed for very high pressure (15,000 psig) exchangers and the demand has made them practically stock units. Government research has fostered new designs of gas coolers for very large volumes of gas at pressure ranges from high vacuum up. Some have gone as high as 1,000 psig at 1000°F. The majority of these new designs use finned surface for low and moderate gas pressures and bare tube surface for higher pressures.

Besides the now well developed field of blast air cooling (jacket water coolers, natural gas coolers, etc.) finned surface is being used for lube oil shell and tube coolers, petroleum reboilers, and various types of condensers.



PIPE AND FITTINGS

by MEADE McARDLE
Monsanto Chemical Co.
St. Louis, Mo.

THE past year has been one of consolidation rather than new development.

Use of stainless tubing, both welded and seamless, has continued to expand as a result of the ease of fitting this material to most jobs. Special fittings and welded prefabrication permit industry to economize in installation labor and material costs.

Application of various plastic coatings to pipe and fittings has grown during the past two years. Jobs which formerly required special alloys for corrosion resistance and product purity are now handled with lined or coated steel pipe. Although some linings may prove to be disappointing, it is reasonable to expect that this trend will continue.

A new austenetic stainless alloy has been strongly promoted. This nickel, chromium, molybdenum, copper silicon alloy usually designated as Alloy 20, is available in tubes and cast parts for pipes, fittings and valves. Its particular advantage is its resistance to sulphuric, mixed, phosphoric, oxalic and fatty acids.

New developments in valves have already demonstrated their value to the industry. A steel gate valve which offers truly stream-lined flow is of special interest. Advances in lubricated plug cock design are of particular importance because of lubricated plug cocks to many piping systems.

Improvements in the details of valve construction have not been neglected. The costly bonnet flange which was formerly required on all pressure valves is being replaced by a balanced seal arrangement which makes use of the line pressure in sealing the bonnet and greatly simplifies construction. New seating material alloys such as K Monel and Stellite combinations are demonstrating exceptional service life.

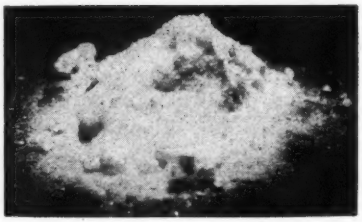
The exacting requirements of the Atomic Energy Commission engineers have resulted in extensive study of bellows seals to replace the packing gland on valves. Sufficient experience has been gained to show that if properly made, a bellows can be expected to give suitable performance for a long period of time.

PIPE AND FITTINGS—New Equipment Announced 1948-49

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*	*Company*
COUPLINGS					
Corrugated Expansion Joint	½" to 25' I.D.	Variety	Corrugation takes up axial, lateral, transverse, or vibratory pipe line movement	Any pressure from vacuum to 50M psi. Any temperature from sub-zero to over 2000° F	Marquette Coppersmithing Co.
Coupling	¼" to 2"	Dural, bronze, steel	Quick-disconnect principle, automatic shut-off upon disconnection, and instantaneous flow upon connection		Roylyn, Inc.
Hose Coupling	½", ¾", 1" I.D. 4½" long	Fabric rubber-covered bronze or Chrome plate	High-pressure type, no friction loss or restriction	Will withstand more than 3000 psi with a pull of over 500 lbs.	Bar-Way Mfg. Co.
Packless Expansion Joint	3" to 24"	Variety	Compact, self-equalizing rings limit compression of each corrugation and support element against internal pressure, flanged or welding ends	Pipe lines requiring service-free method of absorbing expansion and contraction due to temperature changes	American District Steam Co.
Rotating Union	½", ¾", 1", 1½"	Stainless steel, brass, cast bronze	Double row ball bearings and concentricity of threads provides non-wobbling performance	Heating or cooling revolving shafts, cylinders, or drums from —30° F to 300° F with steam, air, or liquids	Deublin Co.
Snap-on Couplings	¼", ⅜", ½", 1½", 2"		Interchangeable on various nipples	Degree of interchangeability varies with type and size of coupling	Ronaflex Tubing Co., Inc.
Swivel Joint	To 1" I.D.		Internal equalizing chamber balances pressure on swivel seat. Ball bearing reduces friction. All metal construction eliminates packing		Seamlex Co.
Tube Union	¼" to 4" tubing	Aluminum, steel, stainless steel	Higher weight, single threaded connection, metal to metal seal, standard AN threads and flares	Light wall tube lines, corrosive chemical lines, food processing lines	Roylyn, Inc.
PIPE and TUBING					
Flexible Hose	¼" to 3" I.D.	Stainless steel Nos. 304, 347, or 316	Heavy wall, helically corrugated, corrosion resistant, non-magnetic hose of one piece construction. Can be bent to diam. of from 4" to 36", depending on size	To convey acids, chemicals, air, steam, and gases with temperatures up to 1600° F and burst pressures up to 14M psi	Finn & Co.
Glass Pipe and Fittings	6" I.D.		Transparent, heat and chemical resistant, enlarged size	Liquid conveying systems, acid and fume vent lines, pilot plant fractionating columns. Low-pressure applications only	Corning Glass Works
Porcelain Piping	To order	High-fired white porcelain	Zero porosity, high heat shock resistance, freedom from iron content		The United States Stoneware Co.
Seamless Tubes and Pipes		Various nickel alloys	Increased size of pipe diameters up to 9¼" and lengths up to 12' and seamless tubing 8" in diameter, up to ¾" wall thickness, and varying lengths		The International Nickel Co.
VALVES					
Ball Type Inner Valve		Stainless steel ball	Single seated with ball inner valve actuated by rubber diaphragm. When off the seat ball is free to turn for uniform exposure to scouring action of flow	For accurate regulation of steam, air, water, or gas at inlet pressures less than 250 psi, reduced pressures below 150 psi	Hamilton-Thomas Corp.
Butterfly Valve	3"–12"	Variety	Wafer-type, air-operated, with positioner and hand jack screw. Low pres-	Paper stock, light slurries, corrosive. Not over 50 psig differential	Fischer & Porter Co.

PIPE AND FITTINGS—New Equipment Announced 1948-9 (Continued)

Type of Equipment	Sizes	Materials of Construction	Distinguishing Features	Applications and Limitations	Company
Butterfly Valve	4" to 72"	Hastelloy stem	Wafer-type with body and vane covered with lastex rubber. Minimum resistance to flow. Vane turns 360° for tight shut-off	Standard for operating pressures below 25 psi, available for pressures up to 100 psi	W. S. Rockwell Co.
Check Valve	2", 3", and 4" for 150 and 300 psi		Main and primary seats and discs worm and gear driven to provide positive control. Throttled or closedwithout shock	For tight seal under extreme conditions. Temperature range from —40° F to 300° F	Tork-Master Co.
Check Valve	¼" to 2"	Forged steel body, variety of parts and trim	Horizontal lift, union cap	Oil or oil vapor, steam, or water control under high pressures	The Ohio Injector Co.
Check Valves	125 psi	Bronze	Lift check and swing check types. Lift check has two renewable side plugs	Lift check affords positive seating, and swing	The Lunkenheimer Co.
Control Valve			6-position valve, 4 normal operating positions and 2 standby. Pilot controlled, powered by feed	All types zeolite softeners, ion-exchange systems, pressure filters	Cochrane Corp.
Control Valve	1" to 8"	Steel, stainless steel Nos. 304, 316, and 347	Angle type balanced plug with dead tight shut-off	Gas transmission and underground storage of natural gas. Max. temperature 550° F. to 3000 psi water pressure	Hammel-Dahl Co.
Control Valve	⅜" to 2½"	Steel, stainless steel Nos. 304, 316, and 347	Valve stem can be positioned to .001" at 15,000 psi water pressure	High pressure synthesis. Max. temperature 1400° F	Hammel-Dahl Co.
Diaphragm Valve	½" to 2" with screwed ends, ½" to 4" with flanged ends	Iron	Packless, limits diaphragm function to sealing bonnet only. Neoprene insert assures tight seating	For services not exceeding 150 psi and 180° F	Crane Co.
Diaphragm Valve	½" – 4" flanged ends	Neoprene lined and coated	Packless, limits diaphragm function to sealing bonnet only	For service where abrasion is a major destructive force	Crane Co.
Discharge Check Valve		Variety	Designed to minimize fouling. Operated with or without manual control or from access box	Protects against contamination of liquids, fouling of pumps and equipment by surging	J. A. Zurn Mfg. Co.
Gage Valve	⅛", ¼", ⅜", ½", ¾", 1"	Carbon steel, 13% Cr. stainless steel 18–8 stainless steel	Taper threaded body bonnet joint for tightness	Gage, meter, dead end, and instrument service	Edward Valves, Inc.
Gate Valve	¼"–2" 600 psi	Cast steel, Exelloy seats, stainless steel disc	Screwed ends, in sizes ¾–2", the bonnet ring, bonnet and yoke are separate parts, smaller sizes are cast in one piece	For superheated or saturated steam, hot or cold water, air, natural gas, gasoline, and fluids that are non-lubricating and non-corrosive. Max. T=850° F.	Crane Co.
Gate Valve	¼"–2" 600 psi	Cast steel, Exelloy seats and discs	Separate bonnet ring, bonnet, and yoke in sizes ¾–2", smaller sizes are one piece	For oil and vapor up to 1000° F	Crane Co.
Gate Valve	¼" to 2" 600 psi	Forged steel body, variety of parts and trim	Outside screw and yoke, union or bolted bonnet	Oil or oil vapor, steam, or water control under high pressures	The Ohio Injector Co.
Gate Valve	¼" to 2" 200 psi	Steam bronze, ASTM B61, and bronze stems	Rising or non-rising stem, integral seat, solid or double-tapered wedge, screwed end	For steam at 200 psi (550° F), for cold water, oil, or gas non-shock service of 400 psi	The Ohio Injector Co.
Gate Valve	½", ¾", 1"	Stainless steel	Union bonnet type, ball and socket point contact discs, back seating for repacking under pressure, minimum of 6 turns of packing	For breweries and fabricated equipment	The Cooper Alloy Foundry Co.
Globe and Angle Valves		Bronze body, stainless steel or nickel alloy discs and seats	Interchangeability of disc-and-seat combinations for full portway (2 types) of throttle portway use under various operating conditions		The Fairbanks Co.
Globe and Angle Valves	125 psi	Bronze body and discs, malleable iron handwheel	Designed for strength and length of service with renewable discs on ¾" and larger sizes		The Lunkenheimer Co.
Globe and Angle Valves	¼" to 2" 600 psi	Forged steel body, variety of parts and trim	Inside or outside screw, union or bolted bonnet	Oil or oil vapor	The Ohio Injector Co.
Globe Valve	⅛", ¼", ⅜", ½", ¾", 1"	Carbon steel	Swing bolted gland for ease in repacking	All-purpose valve for variety of services	Edward Valves, Inc.
High Pressure Reducing Valve	1", 1¼", 1½", and 2"	Stellite control valve, stainless steel liner and piston, Monel diaphragm	No change of spring or diaphragm needed from minimum to maximum reduced pressure setting	For steam at inlet pressures of 300 to 1500 psi; air or gas at inlet pressures from 300 to 3000 psi. Reduced pressures range from 100 to 600 psi. Maximum inlet temperature 1000° F	Leslie Co.
High Pressure Reducing Valve		Forged steel body, chromium plated stainless steel parts	For working pressures to 6000 psi	For water, oil, and compressed air pressure reduction in single stage to 250 psi or within 20% of initial pressure. For use in 2-stage reduction to lower pressures.	The Atlas Valve Co.
Instrument Valve	¼", ⅜", ½", ¾", and 1"	Carbon steel, 12% Cr. stainless steel	Swing bolted gland for ease in repacking. 6000 psi with water, oil, and gas	For extreme pressure instrument service	Edward Valves, Inc.
Needle Valve	⅛", ¼"	Brass or aluminum alloy body, duronze needle stem	1/16"–40 steam threading permits close adjustment. Long 10° included angle tapered needle for fine metering	Sensitive metering of fluids and gases	The Parker Appliance Co
Packless Valve		Variety of corrosion resistant alloys	All-welded bellows which seal valve stem against any corrosive agent	Adaptable to a wide range of manufactured valves	Cook Electric Co
Packless Valve		Brass	90° valve of bellows type designed for a minimum flow resistance. Solder or pipe thread connections	High vacuum service	Vacuum Electronic Engineering Co.
Plug Valve	1" to 3"	Plug of Duriron or Durichlor. Body and gland of Durimet 20.	Corrosion-resisting. Shank of plug is stainless steel permanently bonded to plug, is unbreakable. Teflon packing seal		Duriron Co., Inc.
Plug Valve	½" to 6"	Bodies of Durimet 20, Chlorimet 243, Durco D-10, NY, Inconel, Monel and Ni-Resist	Top-lubricated through plug shank except where shank is too hard, then bottom-lubricated		Duriron Co., Inc.
Plug Valve	¾" to 20"	ariety	Eccentric plug face and body seat to prevent seizing and drag. Synthetic resilient facing on plug (where applicable) to prevent dead tight shut off	For fluids and gases	DeZurikShower Co.
Porcelain Valve	V valve 1 to 6", angle valve 1" and 2", flush valve 1 to 3"	Porcelain contact surfaces, silicon aluminum armor	Addition of protective armor to solid, non-porous porcelain valves. Standard 125-psi flange integral with armor	Protects personnel and equipment against porcelain breakage	Lapp Insulator Co., Inc.
Reducing Valve		Brass body and chamber, stainless steel pin and needle valve	Ballast type gives high delivery pressure with good degree of regulation because force of gas pressure is used to regulate delivery pressure		Hoke, Inc.
Rubber-Lined Valve	To 4", 150 psi	Cast iron body, covered and lined with hard rubber	Double seated type permits use in any position in line. Hard rubber ball disc permits even distribution of wear	For negligible pressure drop, straight line throttling, and high coefficient of discharge	American Hard Rubber Co.
Stainless Steel Valve	H_2O inlet and outlet 1", SO_2 inlet"	All stainless steel	For mixing liquid or gaseous sulfur dioxide and water and any process where a continuous sulfur dioxide-water mixture is required		Ansul Chemical Co.
Steam-Jacketed Valve	2", 3", 4" ¼		For viscous materials which congeal or harden and will not flow at ordinary temperatures	125 psi line and jacket pressures	Everlasting Valve Co.



CRYSTALLIZATION

by H. B. CALDWELL
Swenson Evaporator Company
New York, New York

DURING the past twenty-four months, the chemical industry has seen no fundamentally new designs of equipment to cool and crystallize solutions. However, there have been refinements in design, and the extension of established techniques to new products.

For crystallizing by cooling non-aqueous solutions, especially to temperatures below 60° F, preference has been established for mechanical crystallizers using chilled water and/or brine. Anthracene and naphthalene are typical examples. Tubular heat exchangers are usually indicated between the hot feed and cold filtrate.

Increasing demand for closely controlled

PIPE AND FITTINGS—New Equipment Announced 1948-9 (Continued)

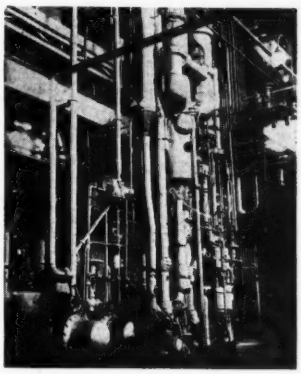
Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*	*Company*
Valve	½" to 10", and standard flanges		Tight shut-off despite corrosion or deposits, self-cleaning action, multiple seat design, injection sealing		Sellers Injector Corp.
Valve			Inside passage clear of all obstructions and cross-section changes. Instant opening action, self-closing	For pulpy, viscous, or acid mixtures	Wright-Hall Products, Inc.
Velocity Limiting Valve	¼" and to order	Brass body, stainless steel parts	Pressure calibrated to shut off line flow when velocity or volume exceeds desired setting	Regulates high limits of flow velocity and volume in air or gas lines	Pneu-Trol Devices, Inc.
MISCELLANEOUS					
Blind Flanges	3", 4", 5", 6", 8" and to order	Molded fabric materials	Non-sparking, non-corrosive, light weight	Withstands 15 to 20% sulfuric acid solutions. Tested at 400 psi live pressure	Gatke Corp.
Buffer Gasket	1¼", 1½", 2½", 3", 4", and 6"	Butyl and Buna-N compounds	Flexibility and safety in coupling glass or porcelain lined pipe. Buffer ridge provides tight seal and smooth flow	Butyl rubber for hot and cold water, acids and alkalies in water solutions. Buna-N for oils, greases, and solvents. Temperatures to 180° F	Drinkwater, Inc.
Corrosion Inhibitor Zinc Rods	⅛", ¼", ⅜", ¾", 1" diam., and lengths to 12"		Fitted with standard pipe-plug ends	For insertion into piping and hydraulic equipment	Rotometals, Inc.
Drain Trap	½", ¾", 1", screwed or flange		Steady, continuous action to eliminate steam and heat losses, pressure drops, air binding, freeze-ups, hammer and chatter. Interchangeable orifices	Steam, gas, or air at 150 psi or 300 psi, temperatures to 750° F	W. S. Rockwell Co.
Ejector	0.5 to 2.5 gal. per 24 hrs.		Liquid ejection by use of two ceramic tubes, one water-repellent, the other water-permeable but air-impervious	Removal of water and water-oil emulsions from compressed air or gas lines	Selas Corp.
Flanges		Aluminum	First aluminum welding flanges	For all-welded aluminum piping systems for chemical, food, soap, and cosmetic plants; refineries	Tube Turns, Inc.
Jacketed Cocks, Fittings, and Piping	1¼"x2" to 4"x6"	Nickel - molybdenum alloy iron	For handling materials ordinarily solid or viscous which must be hot for easy flow	Temperatures to 550° F	Parks Cramer Co.
Low Temperature Insulation	½"x12" pipe, ¼"–8" tubing, various thickness	Resin-bonded mineral wool (Zerolite)	Resistant to fire, moisture, attack by many organic solvents. Temperature range −400° F to +250° F, thermal conductivity at 0° F 0.25	Low temperature insulation in oil and chemical industries. Will not resist acids or withstand long service above 250° F	Johns-Manville
Lined Pipes and Fittings	1½" diam. minimum, 20' length maximum	Rubber, plastic (Heilex), lead	Complete lining and fabrication of piping and duct systems	Handling corrosive liquors and acid fumes	Heil Process Equipment Corp.
Magnetic Separator	2", 3", 4" threaded or flanged, 75 psi	Alnico magnet	Permanent magnet attached to "U" shaped pipe section forms magnetic barrier for removal of tramp iron from liquids in pipeline		Eriez Mfg. Co.
Packing	¼" to ½"	Teflon and kel-F	Eliminates packing box on all control valves	All fluid flow except molten sodium and potassium	Hammel-Dahl Co.
Pipe Bender			Self-contained, portable, hydraulic, ram type for bending up to 2" extra heavy weight steel pipe into various shapes		Wallace Supplies Mfg. Co.
Pipe-Fitting Insulation	Variety sizes and shapes	Foamglas	Resistant to water, vapors, fire, and fumes	To retain or exclude heat from −200° F to 800° F	Pittsburgh Corning Corp.
Pipe Mending Cement			A positive seal for repairing split soil pipes, sandholes, cracked pipes and gaskets without previous surface preparation		Lake Chemical Co.
Pipe Wrap		Glass fibers and yarns	High tear strength permits quick application for covering underground pipe lines		Owens-Corning Fiberglas Corp.
Reducing Bushing	1" to 10" I. D. "Karbate" pipe	"Karbate"	Increases adaptability of "Karbate" piping for high corrosion resistance		National Carbon Co., Inc.
Seamless Welding Tee	¾"–20"	Variety	Full branch outlets, tape-designed	High pressure and/or temperature. For corrosive, erosive, or vibration conditions in pipeline	Ladish Co.
Separator	½" to 1½"	Iron body, stainless steel parts	Small size, efficient separation of oil or water from air or steam	Maximum pressure 250 psi saturated	Strong, Carlisle & Hammond Co.
Separator Trap	½", ¾" to 150 psi; 1", 1¼", 1½" to 200 psi		Combination type compact unit with automatic ball float trap discharge. Negligible pressure drop	Removal of entrained moisture and condensate from air supply lines	Clark Mfg. Co.
Spray Nozzle	1" "Karbate" or I.P.S. thrd.	"Karbate"	Compact, light weight, adaptable, corrosion resistant	Spraying of corrosive or non-corrosive fluids in corrosive atmospheres	National Carbon Co., Inc.
Stainless Steel Pipe Fittings	To 14" I.P.S.		Increased size of fittings and pipe in austenitic stainless steel especially resistant to nitric-sulfuric acid mixtures		Electric Steel Foundry Co.
Steam Trap			Small inverted bucket type, adaptable to many uses with a minimum of pipe rearrangement	To 150 psi and 375° F	
Steam Trap	½" and ¾"	Iron body, stainless steel parts	Small compact air eliminator	Small steam units to 150 psi	Strong, Carlisle & Hammond Co.
Steam Trap	½", to 150 psi		For installation straight-in-line or as elbow for small units. Capacity rating of 700 lbs. per hour (continuous flow) at 20 psi		V.D. Anderson Co.
Steam Trap with Strainer		Semi - steel body, stainless steel working parts	Integral strainer eliminates 2 pipe joints and external strainer	Small trapping purposes to 150 psi	Armstrong Machine Works
Strainer	¼" to 2"	Iron body, Monel screen	Y type for air, water, oil, and steam lines to 250 psi		Strong, Carlisle & Hammond Co.
Threadless Piping and Fittings		Brass and copper pipe and tubing, bronze fittings	Threadless fittings for brazing to I.P.S. brass or copper base alloy tubing or pipe to obtain strong one-piece system	For 150 psi pressure lines at 450° F or 300 psi non-shock cold water, oil, or gas lines	Stanley G. Flagg & Co.
Tube Fitting	⅛"–2" O.D. tube size	Steel, stainless steel, aluminum	Standard 37° flare angle; dryseal pipe threads		Parker Appliance Co.
Valve Seat		Plastic	Soft non-extruding plastic incorporated in check valves to withstand back pressures in excess of 1000 psi		Hoke, Inc.
Water Hammer Arresting Device			Permanently sealed air chamber provides air cushion for elimination of damaging effect of water hammer		Wade Mfg. Co.
Welded Pipe Tee	24" and over	Variety	X-rayed welded pipe with full branch outlets and taper design	High pressure and/or temperature. For corrosive, erosive, or vibration conditions in pipelines	Ladish Co.

size and uniformity of crystals is usually met by continuous vacuum crystallizers. Especial attention is paid to controlling the rate of nucleation and the total amount of crystal surface present. A further refinement offered by at least one manufacturer is the addition of an hydraulic classifying device through which the crystal product is discharged.

Uniformity of crystal size is helpful in obtaining non-caking and free-flowing characteristics of the product, as well as improved separation of mother liquor, washing and drying, hence the demand for the elimination of fines and dust. For some products such as ammonium sulphate, which may be mixed with other fertilizer materials, a 40 to 60 mesh crystal size is preferred rather than larger sizes which tend to segregate from such mixtures.

In the production of ammonium sulphate from anhydrous ammonia and strong acid present practice carries out the reaction within the crystallizer or its circulating piping, the heat of reaction being dissipated by vaporization of added water. Either vacuum or atmospheric operation may be employed. Patents exist covering such operation. Single units producing as much as 200 tons per day of ammonium sulphate are in operation.

It is evident that extended use will be made of the vacuum crystallizers due to the absence of heat transfer surface employed in other types which tends to "salt-up" during operation. Development will be directed toward multi-stage continuous operation for economy in large tonnage production, and controlled crystal size.



ADSORPTION

by CLYDE BERG
Union Oil Company of California
Los Angeles, California

ADSORPTION has increased in importance as a unit process over the past two years. It is effecting separations and recoveries in many fields more efficiently than the older operations of distillation and solvent extraction.

The Hypersorption process, now in its third year of commercial use, continued to expand with the erection of a huge refinery unit to recover hydrocarbons from cracking gases and the installation of another unit for chemical processing. In addition to the current applications, such as ethylene recovery, production of pure methane and recovery of light hydrocarbons, an extensive new field of application is now becoming apparent in the treatment of natural gases. In this application the Hypersorption units will separate the diluent nitrogen from natural gas streams low in BTU content and unused because of this contaminant. Simultaneous with the upgrading of fuel value and release of huge sources of natural gas, complete recovery of the important by-products of ethane, propane and butane will be effected, materially augmenting our supply of these materials.

The development of ion exchangers has continued with further improvement of resins for both cation and anion exchange. Application of these materials included the recovery of drugs, separation of amino acids and recovery of valuable metals from dilute solutions as well as the production of ion-free water.

The exploitation of chromatographic technique as well as specific adsorption continued to be a widening field for the separation of drugs, such as penicillin, streptomycin and the newer antibiotics, as well as the more basic organic compounds of chlorophyll and its derivatives. Additional commercial installations of both percolation and filter-type plants for the treatment of lubricating oil fractions by adsorbent clays were made this year.

Generally, the application of adsorption techniques has continued at an active pace with application of the new developments in this field being exploited more and more widely for separation of materials.

SAFETY

by J. J. HOFFMAN
Monsanto Chemical Company
St. Louis, Missouri

DURING the period since the war, manufacturers of safety equipment moved to develop equipment and apparatus of lighter weight and greater stability. This trend, quite logically, was actuated by developments and improvements made during the war years, as well as increased availability of such lighter raw materials as aluminum, magnesium and various plastics. This trend still continues. However, experience seems to indicate somewhat of a change in opinion regarding their general use. For instance, it appears that lightweight metal ladders (which are very good) are unlikely to entirely replace wooden ladders. Nor does optically ground plastic appear to be ready to replace case-hardened glass in

ADSORBERS—New Equipment Announced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*	*Company*
Demineralizer	60 gph		2-bed model to deliver distilled water by ion exchange. Includes ion exchange resins, valves, piping, and tanks for regenerating resins	Product contains 5 to 20 ppm hardness expressed as $CaCO_3$	American Cyanamid Co.
Demineralizer			Cartridge type with continuous-reading conductivity indicator		American Cyanamid Co.
Demineralizer	5 to 8 gph		Renewable cartridge unit with cation and anion resins with capacity to remove nearly 1200 grains ionizable salts per cartridge		Barnstead Still & Sterilizer Co.
Demineralizer	To 1000 gph as specified		2- and 4-bed models for demineralization of water by use of ion-exchange resins		Industrial Filter & Pump Mfg. Co.
Silica Remover	Variety	Rubber-lined steel	Employs highly basic anion exchanger		Graver Water Conditioning Co.

safety goggles and spectacles. Nevertheless considerable research is under way to discover new and improved methods for the incorporation of these lightweight, attractive materials into safety equipment. Manufacturers also seem less inclined to introduce equipment until it has been thoroughly proven.

A few of the more recently announced improvements in safety equipment include: Improved coatings for canvas gloves incorporating a wider range of protection against chemical action and abrasion, as well as more comfort for the wearer, are important from a safety as well as a cost standpoint. Several improved canister type gas masks and respirators stressing lightness of weight, increased efficiency and greater durability are now on the market. A new chemically treated filter, for dust respirators, has been placed on the market. First of its kind, the filter provides the same protection as previous filters eight times as large in area plus tremendously increased efficiency over similar untreated filters. This permits smaller filter containers for unobstructed front and side vision and lighter weight. While not available as yet, rumor has it that the long awaited (U. S. B. approved) chemical cartridge for respirators is not too far away. Plastic face shields and eye coverings of various types have shown improvement as the result of design for specific exposures rather than general protection. Research underway at present with laminated case-hardened glass points to greater protection in safety goggles, spectacles, guards, etc.

In the field of fire protection, the astounding dry powder method of extinguishment is further improved by combining lighter weight and more compact extinguishers in greatly increased efficiency in expulsion. The use of water fog fire extinguishment continues to receive much attention—pressures of 300 pounds and greater are being used to produce exceptionally good results on many types of fires.

It appears almost certain that at least two of the most serious problems that confront chemical safety engineers will be solved in the near future—lightweight respirators for protection against chemical fumes and more efficient safety glass. The continued trend toward lightness of weight and greater wearer comfort are indicative of the progress being made by manufacturers.

GRINDERS

by S. B. KANOWITZ
Raymond Pulverizer Division
Combustion Engineering
Superheater, Inc.
New York, New York

THE past biennium has not seen any major developments in the design and construction of pulverizing equipment. Larger units of existing types were developed to increase the output. Not only the first cost of the equipment per unit of material pulverized has decreased, but also the power and labor cost per unit of output.

Special alloys have been developed not only to better withstand abrasion but also to withstand higher temperatures and the corrosive action of various chemicals being ground.

Improvements have been made in the so-called jet, fluid energy pulverizers and high speed vertical or horizontal pulverizers for producing particles of sub-sieve sizes having a more uniform top size. This

GRINDERS—New Equipment Announced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*	*Company*
Grinding Ball			Sphere with a portion of surface flattened		H. K. Porter Co.
Hammer Mill	Up to 15,000 lbs/hr.	Cast iron, steel, Al, Monel, Ni, bronze	Roll or drum feed	For solids with a high moisture content	Pulverizing Machinery Co.
Ultrafine Hammer Mill	Up to 4000 lbs/hr.	Ni-Fe alloy, stainless steel	Close control over particle size	Clays, pigments, etc.	Pulverizing Machinery Co.

SAFETY—New Equipment Announced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*	*Company*
Acid Hood		Vinyl plastic	Light-weight acid-resistant hood. Snap-on type with vulcanized fiber headgear. Natural ventilation with baffled air vents		Mine Safety Appliances Co.
Carboy Drainer	For 5, 10 and 13 gal carboys	Rubber	Prevent splash or spill when draining carboys		Wahlert Safety Products Co.
Coated Fabric Gloves	Wrist to 14"gauntlet	Plastic coat	High resistance to abrasion and chemicals		Surety Rubber Co.
Dry Chemical Fire Extinguisher	2 lbs. dry chemical		New small extinguisher using dry chemical extinguishing agent		Ansul Chemical Co.
Dry Chemical Fire Extinguisher	20- and 30-lb. caps		Will discharge dry powder 20'. One-hand operation	Flammable liquid and electrical fires	Walter Kidde & Co.
Dry Chemical Fire Extinguisher	20- and 30-lb. caps		Dry chemical is non-conducting, non-corrosive, non-toxic and non-freezing	Flammable liquid and electrical fires	C-O-TWO Fire Equipment Co.
Fire Extinguisher	2½ gal	Welded Si bronze	Soda-acid, foam, water, and anti-freeze types. Welded containers replace riveted containers		American-La France-Foamite Corp.
Foam-Type Recharge	Hand extinguisher		Foam-type recharge for hand extinguishers	Petroleum product fires	National Foam System, Inc.
Gas Detector			Remote "heads" analyze atmosphere for combustible atmospheres, "telegraph" results to central control which gives audible or visible alarm or takes over control of fire-fighting machinery		Lor-Ann Instruments Co.
Gauge Glass Protector			Transparent guard protects employees from splinters of flying glass		Wright-Austin Co.
Hycar-Coated Leggings	1 size—6 adjustments	Cotton duck impregnated with Hycar	Protect legs against oil or chemical splash		Safety Clothing & Equipment Co.
Metal Safety Hose	All standard sizes	Cu-clad steel	Flexible metal hose of full interlocked construction and asbestos-packed		Pennsylvania Flexible Metallic Tubing Co.
Plastic Aprons		Clear brown vinyl resin sheet	Light-weight and wear-resistant		Safety Clothing & Equipment Co.
Vaporizing Liquid Fire Extinguishers	2 qt. and 1 gal.	Cu, brass	Combination, level-operated nozzle has 360° swivel coupling fixed to extinguisher	Flammable liquid or electrical hazards	Pyrene M'f'g. Co.

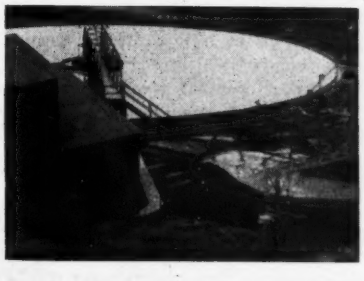
type of equipment is being used for dispersing agglomerates and for blending.

Pulverizers are now used not only for drying and pulverizing in one operation but also to work in conjunction with standard drying equipment either to take a partially dried material and finish the drying while the material is being pulverized or to partially dry and pulverize and finish the drying in a conventional dryer.

Finally important developments have been made in equipment for measuring particle size distribution of pulverized materials and also on their physical character. These throw a great deal of light on the proper type of pulverizer to use to produce products having the desired physical character.

AUXILIARIES—New Equipment Announced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*		*Company*
Automatic burner	To 600 BHP		Fully automatic oil burner that preheats, pumps, and burns oil at specified firing rates	Steam generation for power and heat		Peabody Engineering Corp.
Bowl feeder			Electro-magnetic vibration produces circular traveling and climbing motion	Readily controlled feeding of small pieces, parts, or bulk powders		Syntron Co.
Carbon brick	13½″x6″x3″, 14.4 lb. 13½″x(6″-5″)x3″, 13.2 lb. 9″x6″x3″, 9.5 lb. 9″x(6″-5⅜″)x3″, 9.1 lb.		New sizes			National Carbon Co.
Corrosion-resistant paint			Applicable without prior use of primer	Chemical, food, oil refining, and general processing fields		The U. S. Stoneware Co.
Electric motor	Frame sizes 254, 284, 324, 326		Drip-proof polyphase motor in new frame sizes			Wagner Electric Corp.
Electrical connectors	10 to 24 inserts	Bronze, aluminum	Water proof, gas proof, explosion proof. Quick disconnecting	Under water. On exposed equipment and extension cords		Roylyn, Inc.
Flooring compound			Resinous corrosion-resistant material for troweling purposes over concrete			The U. S. Stoneware Co.
Gasholder	1-5000 M ft.³	Steel	Dry frictionless seal	Storage of chemical and petrochemical process gases	Maximum storage pressure 20″ H_2O	General American Transportation Corp.
Insulation	Sheets, lagging, and pipe insulation	Zerolite	Highly resistant to fire, organic solvents, and moisture	High and low temperature insulation of vessels, tanks, and pipes	—400° to 250° F	Johns-Manville
Jet cleaner	50 gal. tank 50′ hose		Portable. No moving parts. Adjustable detergent temperature and flow. Requires steam and water feed	Cleans heat exchanger bundles, coils, process equipment	Jet pressure adjustable to double initial steam pressure	Sellers Injector Corp.
Magnesium anode for cathodic protection	X-section ⅜″x¾″ length 1, 2, and 5M′	Magnesium ribbon iron wire core	Iron wire core allows permanent electrical connections and prevents segregation	Protection of buried metal structures from corrosion primarily in high resistivity soils		Dow Chemical Co.
Pellet mill			Variable-speed conditioner drive. Applied hp—75	Pelleting alumina, clay, carbon, and other chemicals	Capacity 5 T per hr.	Sprout, Waldron & Co.
Pelleting press			Independent control of charging, compacting and ejecting ram actions. Suitable for solid or cored parts.	Processing powdered or granular forms of ceramics, chemicals, and plastics		Denison Eng. Co.
Rectifier	0-8 v., cap. 100 amp. 0-16 v., cap. 50 amp. 0-24 v., cap. 35 amp. 0-48 v., cap. 18 amp.	Selenium	6 interconnectable rectifier sections. Ripple content of output 5% at any voltage and current	For lab use on 220 or 440 volt 3-phase AC		W. Green Electric Co.
Resin pilot plant	5 gal.		Portable unit with instrumentation, working table, kettle, Liebig condenser, 5″ straight blade open turbine agitator, helical cooling coil, 3 electrical resistance heaters, variable speed agitation unit. Allowable pressure 15 psi internal to full internal vacuum			Blaw-Knox Co.
Ring packing		Synthetic rubber	Eliminates damage due to extrusion of packing material into clearance space between mating parts	—70° F to 250° F, 0-3000 psi		Greene, Tweed & Co.
Rotary mechanical seal	1½″ to 6″	Corrosion-resistant metals, glass-lined steel, carbon	Reduce leaking, repacking, friction, and wear between packing and shaft. Permits high internal pressure	Glass-lined reactors and other vessels with agitators operating under internal pressure		Glascote Products, Inc.
Sanitary motor			Free of cracks, recesses, or depressions. Smaller ratings can be totally enclosed and non-ventilated. Larger ratings are splash-proof. All sizes can be washed down			Louis Allis Co.
Test plugs	¼″ to 2″		Testing pressure actuates plunger with sufficient force to hold seal regardless of actual testing pressure. Seals plain or threaded holes in flanged or fitted openings at any pressure to 500 psi			Mechanical Products Corp
Totally-enclosed fan-cooled motor	Frame size 736		Approved by Underwriter's Laboratories for Class I, Group D and Class II, Groups E, F and G hazardous locations		200 hp at 3500, 1750, 1160, or 870 rpm, 550 volts or less, 150 hp at same speeds on 2300 volts	Wagner Electric Corp.
Totally-enclosed non-ventilated motor	5 hp, 4 pole		Silicone resins for winding insulation and silicone grease for bearing lubrication permits reduction up to 3 frame sizes from present standard Class A insulated totally-enclosed motors			Westinghouse Electric Corp.
White porcelain vessels	Standard and special shapes	High-fired white porcelain	Heat-shock resistant, freedom from iron content, zero porosity	Laboratory and plant		The U. S. Stoneware Co.



CLASSIFICATION AND SEDIMENTATION

by A. ANABLE
Dorr Company
New York, New York

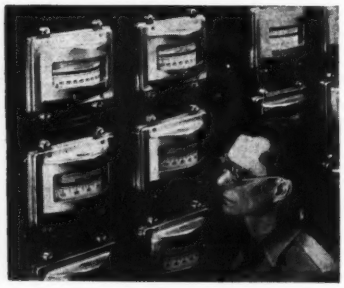
DEVELOPMENT of new sedimentation and classification equipment during the past two years was principally improvements of existing designs.

One company has introduced a more rugged and powerful hydroseparator for use in treatment of phosphate rock, sand, coal and many other high-tonnage, heavy-duty fields. Sizes range well beyond 100 feet in diameter. If an overload is encountered the entire rake mechanism is automatically raised up to two feet off the bottom of the tank.

The same company has made the first major design change in its classifier in fifteen years. A totally new mechanical principle is employed. Moving parts have been reduced. The path traced by the reciprocating rakes more clearly approaches the ideal rectangular shape. A vertical rake lift of more than twelve inches is provided. The rakes, tank, feed launder and general tank arrangement remain essentially the same.

SEDIMENTATION—New Equipment Announced 1948-9

Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*		*Company*
Classifier			3-point support for mechanism. Rake path is rectangular with rounded corners			Dorr Co.
Flotation Machine	Cells 16″x16″ up to 56″x56″	Iron and steel, rubber-covered, wood	High flexibility from new transverse concentrate removal launders and adjustable overflow lips	Separation of solids from solids in a liquid. Also separate solids from liquid		Denver Equipment Co.
Low-Head Sifter	20 and 55 ft.² screen area	Mg or stainless steel sifter box and sieves. Fe base	All metal construction permits sifting up to 200° F. Can be washed with water inside and out	To grade dry granular products into 2 to 7 sizes according to particle size	1 to 200 mesh screen. No wet or sticky materials	Allis-Chalmers Mfg. Co.
Magnetic Drum	18 drum widths from 12″ to 50″		Revolving cylindrical shell containing a stationary permanent magnet	For use where power to energize magnet is not available		Eriez Mfg. Co.
Magnetic Pulley	18″ and 24″ diameter		Magnetic field about 3 times as strong as standard pulley	Separates ferrous from non-ferrous material	Particle size range from 10 to 200 mesh	Eriez Mfg. Co.
Settling Tank	5-250 gal. from stock. Others on order	Stainless steel, Monel, Ni	All-welded, rounded corners, fast-draining sloping bottom, side outlet nipple	Storing, decanting, settling or aging liquids		Alsop Eng'r. Corp
Turbo Floater	34″–60″	Steel, stainless steel, rubber-covered	Large cell volumes and rake type skimmers eliminates need for multiple banks of cells	Bulk flotations, such as coal flotation		Turbo-Mixer Corp.



INSTRUMENTATION AND PROCESS CONTROL

by R. W. CERMAK
Dow Chemical Co.
Midland, Michigan

THE past two years have brought a number of new developments in instruments and process control for the chemical industry.

In the field of temperature measurement, several new and interesting additions have been made.

One, an electronic potentiometer, requires no battery or periodic standardization since the thermocouple voltage is continuously referred to the standard cell for measurement. A variable capacitor driven by two solenoid coils replaces the conventional slide-wire and motor as the circuit-balancing device.

This same manufacturer has also brought out a six-point round chart recorder using a single pen arm which moves to the outer edge of the chart, deposits one pen, picks up the next pen, comes to balance, prints and repeats every six seconds. Another innovation has been a radation pyrometer for use in the range of 70 to 600° F. Its application is, of necessity, rather limited by emissivity and other factors but has proven of value where the more common temperature measuring elements are not usable.

A special resistance thermometer element and housing also have been developed for measuring the temperature of flat or curved surfaces moving at speeds up to 2000 feet per minute.

An industrial version of the flight test recorder has been brought out by another company for continuously checking up to 160 separate temperature points at a rate of one point every 4 seconds. Normally the unit only indicates individual temperatures but, should any point exceed a preset maximum, the recording mechanism swings into action and continues until stopped.

Several companies now offer differential vapor pressure instruments which have been used rather successfully in controlling overhead product purity from distillation columns. Essentially the transmitter consists of a flexible bellows partially filled with the pure liquid in question, and inserted in the column. Vapor pressure exerted by the pure material is counteracted by column pressure with the unbalance being an indication of column vapor purity.

In flow measurement, considerable progress has been made in meters to withstand corrosive conditions. Several types of all-stainless meters are available both of the conventional and force balance types. A special modification of one type can be rubber-lined and provided with tantalum diaphragms for unusually corrosive service.

A new flow element has been brought out which is a modified venturi with impact type pressure taps, said to give top accuracy, with minimum head loss and freedom from the usual straight run limitations.

A novel level instrument is available for extremely corrosive conditions and consists of a minute quantity of a commercially available radium salt sealed in a float riding on the liquid surface in the vessel. A gamma ray counter located on the outside top of the tank picks up the radiation and sends out a current, proportional to liquid height which can be indicated on a conventional potentiometer type instrument.

A modification of this device also using a radium salt source and a counter has been developed for determining pipe wall and tank shell thicknesses.

In the field of pressure measurement, volumetric type pressure elements are now available for viscous materials or slurries which would plug a conventional pressure tap. Another manufacturer, by evacuating one side of a differential pressure transmitter, can convert the unit to an absolute pressure transmitter having a total range of less than one inch mercury absolute.

Two items which appear to have a bright future are a small differential transformer and the so-called "postage stamp" type strain gauge. Numerous applications have been and are being made using these units alone or in conjunction with other elements for the measurement of motion, thickness, load, flow, pressure and temperature.

For the continuous analysis of product streams, several manufacturers now offer continuous infra-red spectrometers and at least one ultra-violet spectrometer is available. For the continuous analysis of small amounts of sodium, lithium and potassium in liquids such as distilled or demineralized water, a flame photometer has been developed. Several makes of mass spectrometer are also available but at the present time these still remain a highly specialized laboratory tool. However, limited-range mass spectrometers have been developed for use as leak detectors and are finding some application in the testing of high-vacuum equipment both during construction and later, under operating conditions.

The so-called "force-balance" type instruments are becoming increasingly popular for the measurement of pressure, temperature, flow and liquid level.

Practically all makes of control valves can be supplied in packless construction, using a flexible metallic bellows as the sealing device. One manufacturer uses a chevron-type Teflon packing while another has developed a special seal consisting of a cone-shaped Teflon sleeve riding on a super-finished stem. Control valves are

available for higher pressures, temperatures and in a wider variety of alloys and body constructions. The "springless" type motor is also being used more extensively, particularly on single-seated or Saunders patent valves having high unbalanced forces.

Changes in control mechanisms have varied from only minor revisions to complete redesign in some cases, with the basic responses remaining unchanged. One manufacturer, however, has developed an inverse derivative unit which is finding application in certain pressure and flow control problems having relatively short reaction times.

Several companies are experimenting with the so-called "console" type control board and much present development appears to be along these lines with their need for smaller, more compact, instruments.

The list of instruments and trends outlined above is, of necessity, incomplete. It is however, representative of recent progress in the rapidly expanding field of instrumentation and control.

INSTRUMENTATION—New Equipment Announced 1948-9 (Continued)

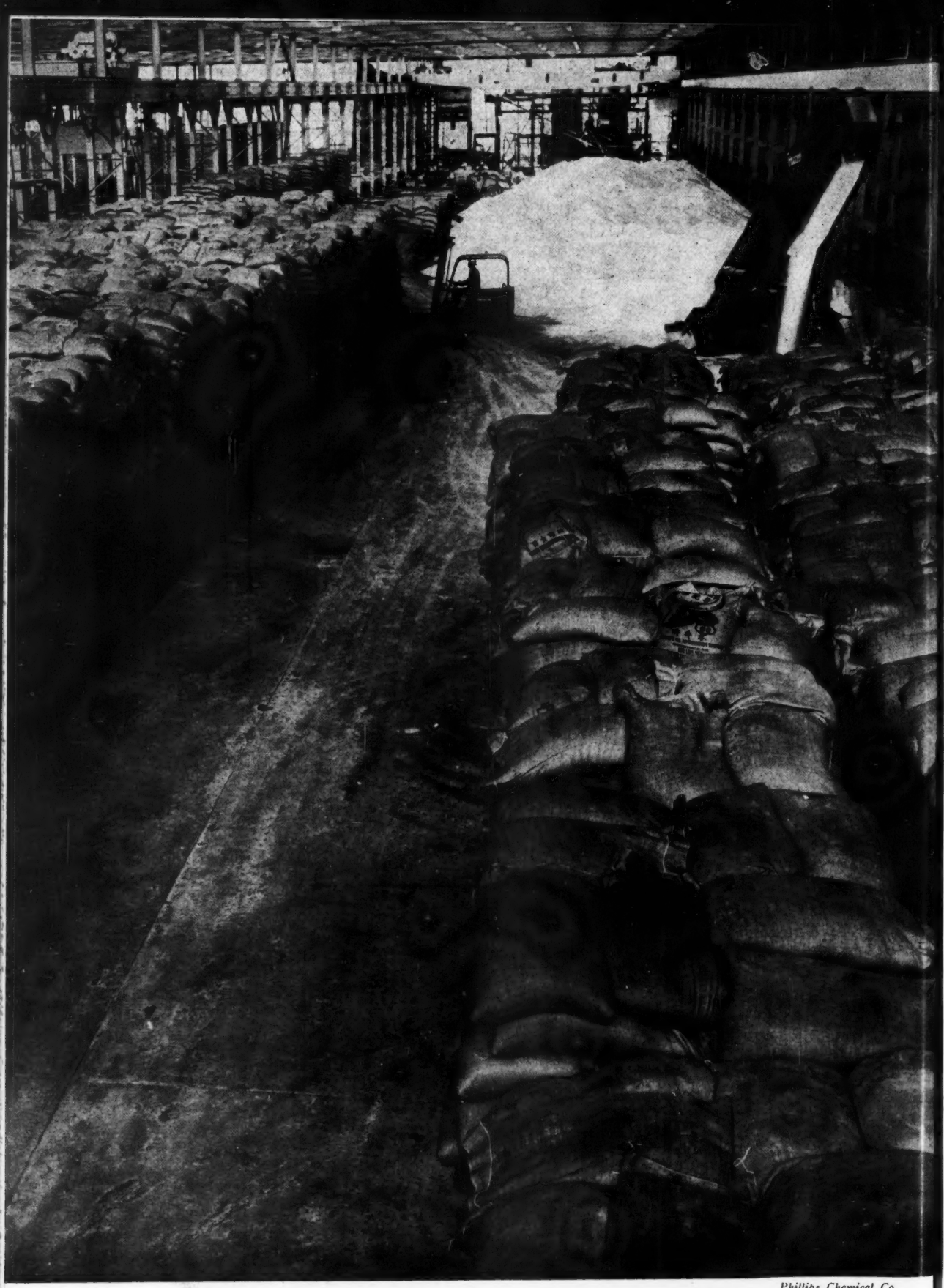
Type of Equipment	*Sizes*	*Materials of Construction*	*Distinguishing Features*	*Applications and Limitations*	*Company*
Adjustable Speed Drive	1/40 hp.	Brass, stainless steel, plastic	Miniature, light, adjustable over wide range	Regulators, controllers, recorders, and adjustable-speed devices	Metron Instrument Co.
Air Meter			3-way operation for air velocity and temperature, and static pressure	Measures air velocity from 10 to 5000 fpm, temperature from 30 to 155° F, and static pressure in in.H_2O from +.05 to + 10 and −.05 to −4.	Anemostat Corp. of America
Air Transmitter			Compact, pilot-actuated unit supplies air output pressure linear with plunger travel	Flow, liquid level, temperature, pressure, mechanical travel, thickness, weight. Standard output air pressure 3–15 psig	Fischer & Porter Co.
Air Velocity Meter	7″x6½″x2½″		Negligible pressure drop through meter	Minimum range 0–1000 fpm	Illinois Testing Laboratories, Inc.
Alarm	127 and 250 mm scale length	Stainless steel in contact with fluid	Inductance type, accurate, reproducible, small hysteresis	Flow, level, and position alarm 110-volt or with relay for others	Fischer & Porter Co.
Alarm System			Automatic electric arm, light or sound, incorporated into flow system to indicate high or low limits of flow		Henszey Co.
Annunciator	1 or more stations		Electrically-operated, automatic reset type, continuous protection, windows or lights	All types warning or indicating systems, not available NEMA #7	Automatic Control Co.
Autoscaler			Compact, complete unit for supplying operating voltage for Geiger-Mueller tube, counting tube impulses, and measuring time required for collecting a given number of impulses. Automatic precision timer interrupts scaling circuit for predetermined number of impulses. Range of voltage supply variable from 500 to 2200 volts.		Tracerlab, Inc.
Chamber Gage	To order		Minimizes effect of boiling action and liquid level fluctuation	Light end service and visual standpipe	Jerguson Gage & Valve Co.
Chlorine Dispenser	10–10M lbs. Cl_2 per day (75 to 1 range)	Steel, leaded brass, lucite, Hastelloy "C," tantalum	Dry vacuum system. Cl_2 flow rate can be indicated, recorded, transmitted, or totalized	Automatic proportioning of Cl_2 to H_2O, sewage, or other flow, or to maintain desired residual	Fischer & Porter Co.
Conductivity Bridge			Line operated AC Wheatstone bridge provides two bridge source frequencies, line frequency and 1,000 cycles per sec.	Range of measured resistance from 0.2 to 2500M ohms with effective scale length of 84″	Industrial Instruments, Inc.
Control Station	4⅛″x4¾″		Indicates process, control-point, and valve pressures. Transfer switches for "bumpless" manual-automatic changeover	Graphic panels, consoles, and standard panelboards	Moore Products Co.
Dewpointer			Increased manometer scale. Thermopiles measure temperature inside observation chamber, Resistance thermometer indicates gas sample temperature stabilization with fog chamber temperature	Dew point determinations	Illinois Testing Laboratories, Inc.
Diaphragm Control Valve	Max.working pressure 250 psi	Cast iron or steel bodies	Pressure-loaded from remote operator or air-operated instrument. No hysteresis	Input to output pressures range from 8 to 1, or 1 to 8 available	Hammel-Dahl Co.
Diaphragm Pressure Switch	10–25 psi		Breaks contact with accuracy of ±¼ lb.		The Electric Auto-Lite Co.
Differential Pressure Control Pilot	½–6 psi, 2–20 psi, 15–75 psi		Diaphragm regulating valve controlled by air, clean water, oil, or gas	Constant differential for process work up to 300 psi maximum total static pressure	Lealie Co.
Differential Pressure Transmitter	25–200 in. H_2O diff. range	Stainless steel or beryllium-copper process bellows	No mercury or leveling required. For static pressures to 1500 psi	High-pressure liquid or gas flow	Moore Products Co.
Dry Flow Meter	25, 50, 100, 150, 200 in. H_2O diff. range		Rupture-proof bellows, 1500-psi working pressure	Measurement of flow without mercury manometer	Brown Instruments Div.
Electric Thermometer	−20 to +120° F		Multiple remote measurements with one direct indicating instrument	Quick response to temperature variations. 100–130 volts, 50–60 cycles AC, DC available	Weston Electrical Instrument Co.
Electronic Load Control		Explosion-proof or standard sheet metal housing	Maintains constant motor load by regulation of input feed. Employs radio type vacuum tubes	Suitable for motors of all ratings used with pulverizers, pumps, extruders	G. C. Wilson & Co.
Electronic Proportionating Relay	13″x10″x4″		Adaptable to any valve or controller with sensitivity and stability	Proportioning action with reset to electric valve motor from proportioning controller	Brown Instruments Div.—
Float Control	1 to 18 circuits		Programmed multiple operations from single float	Remote or local liquid level control or indication	Automatic Control Co.
Flow Gauge	¾″ to 4″ 3.5 to 250 gpm (10 to 1 range)	Various	Pipeline rate-of-flow gauge and sight glass for screwed or flanged pipe connections	Clear or opaque fluids, slurries, and gases. Up to 500 psig, 400° F, accuracy 2% of max. cap.	Fischer & Porter Co.
Flow Meter	2″–8″, 15M–500M lbs per hr. (max.) (5 to 1 range)	Bronze	Compact design with accuracy of 0.5% of instantaneous flow	Aircraft fuel transfer, automotive and aircraft test benches, fuel testing laboratories, and pilot plants	Fischer & Porter Co.
Flume	6″ to 36″ diam. inclosure	Cast iron, bronze, steel, lead	Parabolic outlet, circular inlet, no pockets to collect impurities or solids, self-scouring, accuracy over 10 to 1 range	Measurement of solid-bearing liquids and trade wastes	Simplex Valve & Meter Co.
Gas Analyzer			Thermal-conductivity type, explosion-proof case, unaffected by voltage variations, ambient temperature, sample pressure variations A-C circuit for use with electronic recorder		Bailey Meter Co.
Gas Meter	55–20M SCFM air or equivalent	Stainless steel	Low pressure-drop, all-welded construction, high-visibility scale	Air, butane, propane, natural and refined gas, hydrogen, ammonia, nitrogen up to 60 psig. Non-corrosive liquids	Fischer & Porter Co.
Geiger Counter	5¼″x6½″x4½″. Wt. 7 lbs		Measures low energy beta and alpha particles, gamma and X-ray radiations, detects Carbon 14 and other radio-active tracers. Distinguishes alpha, beta, and gamma radiations		Precision Radiation Instruments Co.
Humidity Simulator	Cap. 10 ft.³ to 35 ft.³	Stainless steel	Controlled humidity conditions from 20% to 95%, from +35° F to +175° F (dry bulb) produced and maintained automatically	To determine moisture resistance or performance, for processing under controlled conditions	Bowser, Inc.
Humidity-Temperature Measuring Kit	30–80% r.h., 40–100° F, and to order		Completely portable, direct-reading dial in % r.h. and ° F, temperature compensated, instantaneous response	Chemical, drug, and detergent process control, packaging, paper mills, air-conditioning. Measures moisture content of non-corrosive gases only and temperatures below +160° F	American Instrument Co., Inc.

INSTRUMENTATION—New Equipment Announced 1948-9 (Continued)

Type of Equipment	Sizes	Materials of Construction	Distinguishing Features	Applications and Limitations	Company
Infrared Analyzer			Continuous automatic analysis of 6-component, flowing gas or liquid stream. Cycling time for 6-component system 6 minutes	Determines optimum process conditions in pilot plant. Provides permanent, accurate record of product concentration and purity in process plant	Perkin-Elmer Corp.
Liquid Level Control		Stainless steel probe rods	High and low type, electrical design, accuracy independent of temperature and pressure	Control of pump or valve to maintain constant limits of liquid level	Photoswitch, Inc.
Liquid Level Control	½" to 2"	Cast iron or steel, bronze, etc.	Max. float power for high pressure service	Continuous condensate removal, level control services	1000 psi water at 100° F. 2" max. high pressure differential	Climax Eng'r. Co.
Liquid Level Gauge	1, 1–10, 1-24 tanks 15–300 psia		Electronic design, accuracy to 1/16" of tank level, low wire count to tanks, adaptable to variety of installations	For selective or simultaneous gauging of multiple tank installations from a central location	Vapor Recovery Systems Co.
Liquid and Pressure Control	0–300 psi		Single unit controls level and pressure	Pressure tanks	Automatic Control Co.
Low Pressure Shut-Off Valve	¾" – 8", control pressure to order		Precision lapped synthetic rubber seat provides positive closure. Mechanical action independent of external actuating forces. High or low pressure use	Gas or fluid lines. Must be reset for closure manually when pressure fails	Security Valve Co.
Magnetic Gas Valve	⅜"–1¼" I.P.S.		Designed to eliminate restricting of plunger operation by gummy or foreign matter forming in solenoid. Solenoid operator sealed to atmosphere to prevent external gas leakage in event of diaphragm rupture	Controls fuel supply line in response to room thermostats, limit controls, or similar devices, for warm air furnaces, gas-fired boilers, industrial furnaces	General Controls Co.
Mercury Manometer	1500 psi	Forged steel	3½" float, non-seizing pressure-tight bearing, positive overrange protection, interchangeable range chambers	Flow, liquid level, specific gravity	Taylor Instrument Cos.
Non-frosting Gage		To order	Transparent frost-preventing unit, sealed to gauge glass and projecting beyond cover bolts	Transparent and reflex types for low temperature fluids	Jerguson Gage & Valve Co.
Oxygen Meter			Direct reading instrument continuously analyzes, indicates, and records percentage of oxygen in boiler flue and industrial gases. Based on paramagnetic property of oxygen, instrument is compensated for ambient temperature, barometric pressure, and variable moisture content of gas and is unaffected by presence of hydrocarbon gases and vapors		Hays Corp.
Oven-Temperature Tester	0–650° F		Portable, D-C millivoltmeter for use with iron copnic (constantan) thermocouples, 2.0 ohms resistance	Quick accurate readings for new installation performance, oven efficiency, control processing. Accuracy †5% full-scale value	General Electric Co.
pH Electrodes and Assemblies			Waterproof plastic electrode assemblies of flow chamber and immersion types, moisture-proof terminals on electrodes eliminate electrical leakage due to atmospheric humidity	Applicable to all pH automatic recording and controlling installations	Leeds & Northrup Co.
Pneumatic Controller			One compact unit combines adjustable throttling range, automatic reset, and automatic-service-manual transfer switch. Requires 2 air-line connections.	Basic element for any air-operated control system or converting electrical to air operation	20 – 200% throttling range, 0.2–50 min. reset time	Fischer & Porter Co.
Pneumatic Controller			Porportional reset type, reduction in and simplification of moving parts, adaptable to changing conditions and applications	Control of flow, pressure, liquid level, and specific gravity of gases	American Meter Co., Inc.
Pneumatic Rotameter, Recorder, and Controller	½" to 2"	Machineable material	Explosion-proof	Fluid-flow recording and controlling	Requires air under pressure	Schutte & Koerting Co.
Pneumatic Transmitter			Unification and simplification of moving parts, adaptable to changing conditions and applications	Measuring and control	American Meter Co., Inc.
Pressure Controls	0–500 psi, 1 to 10 control steps		Permanent setting, sensitive, 1% head accuracy	Liquid level, pressure control or indication (remote or local)	Automatic Control Co.
Pressure Gauge		Bourdon tubes of beryllium copper or stainless steel	For testing high pressure gases and liquids at extreme pressures. Accuracy 1% full scale reading up to 50,000 psi. Accuracy 2% full scale reading 60,000 psi and over		American Machine and Metals, Inc.
Pressure Gauge	4½", 6", 8½", 10"	Phosphor bronze, alloy steel, stainless steel	Permits bleeding or purging bourdon tube for accurate calibration on sealed systems	With diaphragm protectors, sealed systems, acetylene plants	Clapp Instrument Co.
Pressure Gauge	4½", 6"	Aluminum case, tube, socket, and movement as desired	Solid safety front, blow-out disc covers back, adjustable without removing dial	Oil refineries, chemical plants	Wall or flush mounted	Clapp Instrument Co.
Pressure Measuring System	0–10M psi	K-Monel bourdon tube	Based on application of differential transformer with direct-connected tube tip	Dust-tight enclosures suitable for service on corrosive applications. Accuracy within ¼%. Sensitivity 1 part in 4000	Automatic Temperature Control Co.
Pressure Transformer			For use with present types air operated controllers to convert low pressure signals to 2–15 psi. Combined with positive displacement meter to convert RPM into air pressure signal	Initial output pressure signal—from 0–3 psi, top output pressure signal from 10–18 psi. Max. input RPM from 25–3000.	Askania Regulator Co.
Pressure Transmitter	7"x5 7/16"x6"	Aluminum case, stainless steel capillary	Range suppressment at high pressure levels, accuracy ½% of measured range span	Measures 20 to 40 psi range intervals at pressure levels from 35 psia to 415 psia	Taylor Instrument Cos.
Purge Service Flowmeter		Die-cast body, Pyrex or stainless steel float, Pyrex metering tube	Built-in needle valve for close control of purge rates measured in cfh of air or gph of water. Covers range of measurement accepted as standard for bubbler installations		Fischer & Porter Co.
Pyrometer	From 0 to 400° F to 0 to 3000° F		Electronic continuous control (non-cyclic), millivolt type instrument	High limit safety cut-off to protect equipment	Brown Instruments Div.
Pyrometer	From 0 to 400° F to 0 to 3000° F		Electronic continuous (non-cyclic) control, millivoltmeter type instrument	On-off controller for temperature	Brown Instruments Div.
Radioactivity Detector			Midget portable type, compact electronic scaling circuit, large beta and gamma ray sensitive Geiger-Mueller Counter tube	Maximum radiation intensity limited by scaling ratio (25 to 1) to 5,000 counts/minute, can be raised by a factor of 10 or more	Nuclear Development Laboratory
Recorder	12" circular chart		One measuring system (EMF or resistance type) gives up to 6 different simultaneous records, vari-colored dots at 6-second intervals precisely on same time arc	Temperature measurement by resistance bulbs or thermocouples, humidity, pH, conductivity, speed. Resistance and EMF measurement can not be combined in one instrument	The Foxboro Co.
Recording Absolute Pressure Gauge	0 to 20 mm Hg and up		Mechanical type, pressure-sealed lever arm free of lost motion and turning moments due to differential pressure across it	Recorder, automatic controller, remote measurement and automatic control of absolute pressure	The Bristol Co.
Recording Analyzer			One-piece console design, all controls readily available, improved stability and range of adjustment for wide variety of analytical work in shorter time than previously attained	Analysis of solutions in research and process control laboratories	Leeds & Northrup Co.

Type of Equipment	Sizes	Materials of Construction	Distinguishing Features	Applications and Limitations	Company
Recording Chart	.001-.0015″, .002″, and .003″ thick		Coated metal sensitive to very light stylus, fitted flush to eliminate slippage and deviation	For meter and recording instruments operating under extreme temperature and pressure and other adverse physical conditions	Otis Engr. Corp.
Recording Pressure Gage	1, 2, 3, or 4 pens	Stainless steel tube systems	Gas-filled type, pen mechanism and actuating system structure permit easy field installation, standard bulb can be also fitted for temperature recorder	adapted to usual apparatus connections,	Penn Industrial Instrument Corp.
Resistance Bulb	¼″ dia. x length to order (min. 1.7″)	Silver end-spindle, silicone oil seal	Combines accuracy and stability of resistance bulb with adaptability and speed of thermocouple, end-contact design provides sensitivity	All temperature measurement and control up to 600° F using liquid-filled well	The Foxboro Co.
Resistance Thermometer Bulb Rotameter	0 to 300° F	Stainless steel and sanitary fittings Metal back plate, plastic window	For temperature measurements requiring narrow spans and a high speed of response Two or more rotameter tubes combined for related flows. Each tube and fittings independent of other parts	"Reflux" and "Product" in continuous still, "Gas" and "Air" flows to atmosphere furnace, other related flows	Brown Instruments Div.—Brooks Rotameter Co.
Sampler			Automatic unit operates periodically at time intervals from 5 to 60 minutes to move horizontally at constant speed across stream of moving material, diverting sample into a container		Hardinge Co.
Sensing Elements for Gases		Brass, stainless	Bare wire filament provides greater signal strength and longer life	Gas analysis in the process industries with indication, recording and control instruments Not suitable for highly corrosive gases. Little value for qualitative analyses	Gow-Mac Instrument Co.
Sleeve-Type Meter	2″–4″. 7–110 gpm (max.) 15–275 SC FM air (10–1 range)	Variety	Meter parts placed in standard pipe fitting to form complete in-the-line metering unit with low pressure drop	Low and high pressure installations for metering, indicating, recording, transmitting, controlling, proportioning, or totalizing viscous, corrosive, and abrasive fluids and slurries. Will not pass large solids	Fischer & Porter Co.
Smoke Density Recorder			Electronically-operated recorder, bolometer type smoke detector, and sealed beam light source measures and records density of smoke and dust. Temperature compensating circuit eliminates errors due to high ambient temperatures		Bailey Meter Co.
Solenoid Valve	Up to 150 psi, ¾″ to 2½″		Designed to meet emergency or safety requirements where normally open position is desired. Remains closed as long as pressure exceeds 3 psi on inlet side without energized solenoid	Handles steam, hot or cold water, gas, air, gasoline, or oil. For 110, 220, 440 volt, 60 cycle AC	Johnson Corp.
Springless Pneumatic Motor	To meet power requirements		20 to 30 times more powerful than spring type, integral built-in positioner, universal mounting, push-stem or lever type	Actuating valves, large dampers, louvres	Belfield Valve Div.—Minneapolis-Honeywell Regulator Co.
Static Pressure control	0 to 20″ H_2O pressure or vacuum, .2 to 2″ H_2O fixed or variable differential		Regulation of very low pressures in inches of water, either pressure or vacuum. Available with double throw circuits or floating contacts	To control static pressure in duct intake, measure and actuate an alarm when drop across filter reaches some pre-determined value	Coral Designs
Stock Consistency Regulator		Stainless steel	Compact, self-contained, one moving part	Holds dry stock percentage within 0.1%. Recommended for stock in 1–5% consistency range	Fischer & Porter Co.
Strip Chart Mercury Switch Controller			Adaptation of on-off electrical control to advantage of strip chart instrument	Measurement and control of variable	Brown Instruments Div.—
Strip Chart Proportioning Controller			Adaption of electrical proportioning control to advantage of strip chart instrument	Measurement and control of variable	Brown Instruments Div.—
Temperature Controller	0° to 700° F, valve sizes ½″ to 6″		Completely self-contained temperature regulator	Control of flow of liquids or gases in response to changes in temperature	Minneapolis-Honeywell-Regulator Co.
Temperature-Indicating Products			Additional high ratings of temperature-indicating crayons and pellets to range between 1600° F and 2000° F		Tempil Corp.
Temperature Recorder			Indicates and records 160 separate temperatures at a rate of 4 seconds per point. Adaptable for indication only or alarm operation for excess temperature	Refining and pilot plants in any location where large numbers of temperatures are to be logged	Leeds & Northrup Co.
Temperature Transmitter	7″x5 1/16″x6″	Aluminum case, stainless steel thermal system	Standardized 3 to 15 psi output pressure, barometric and temperature compensation, wide adjustable range spans, highly responsive thermal action	Measuring temperatures from −375° to +1000° F, range intervals of 50, 100, 200, and 400° F	Taylor Instrument Cos.
Testing Thermometer	−30° to +120° F, 1–180° F		Armored thermometer, 12″ long, Binoc etched stem thermometer encased in non-sparking brass armor. Meets American Petroleum Institute Code 25 and ASTM 58F-48T and 59F-48T		Taylor Instrument Cos.
Testing Thermometer	−30° to −120° F, 0–160° F		Guaranteed accuracy of ±0.5° F, 16¾″ cup case thermometer, 1° scale divisions, ASTM 58F-48T, and 59F-48T		Taylor Instrument Cos.
Thickness Detector			Measures thickness by measurement of frequency of resonance of ultrasonic waves	Non-destructive thickness measurement of steel, copper, aluminum, glass, and unfilled plastics, from one side	Branson Instruments, Inc.
Time-in-Process Recorder			Records rate of conveyor movement directly in terms of total time consumed by work traveling through a process	Continuous drying and baking ovens, ceramic kilns, and glass leirs	The Bristol Co.
Timer	0–10 min.		Heavy duty construction with mercury switch contacts, no clock gears	Designed for pump, control and certain industrial applications	Automatic Control Co.
Titrator			Automatic delivery of titrating solution to precise, preset end point. Multiple assembly accommodates up to 4 electrically operated burettes	Laboratory analyses and process control where many titrations are made. Automatic pH adjustment of samples and cultures	National Technical Laboratories
Titrating System			Duples controlled volume pump gives area by adding sufficient acid or base to measuring	automatic pH control in non-sensitive bring sample to sensitive area and then	Milton Roy Co.
Transmittancy Recording Attachment for Infra-red Spectrophotometer			Direct recording in transmittancy, elimination of cell matching, theoretical minimum recording time achieved, records are linear in wavelength	Eliminates time-consuming calculations, speeds up infra-red spectrophotometric research and process control	National Technical Laboratories
Vacuum Pressure Regulator			Varying amount of Hg permits control of pressures below 7.50 mm Hg. Dibutyl phthalate permits control of pressures from 0–4 mm Hg		Todd Scientific Co.
Valve Positioner	Valve strokes ¼″ to 3″	Brass forgings and aluminum	Universal mounting for models with and without by-pass. Integral with valve, incorporates stabilizing action, control instrument pressure span may be suppressed	Flow and other difficult control applications	Moore Products Co.
Venturi Type Valve	1¼″ to 6″		Venturi design of valve throat avoids destructive impinging effects at high velocities	Regulation of fluids carrying suspended materials	Belfield Valve Div.—Minneapolis-Honeywell Regulator Co.
Volumetric Meter	3 to 160 gpm	Stainless steel working parts, variety of outer castings	Direct reading, with measuring piston of hard carbon or other materials as required, for metering of corrosive liquids	Measurement of caustic soda, most acids, fruit juices, liquid soap, molten sulfur, and vinegar, when metered free from air under 100° F	Buffalo Meter Co.

ADDRESSES OF MANUFACTURERS LISTED IN THIS SECTION WILL BE FOUND ON PAGE 652



Phillips Chemical Co.

Efficient, mechanized packaged materials handling is in many cases a last frontier for cost reduction.

PACKAGING AND SHIPPING OPPORTUNITIES FOR ECONOMY

FORWARD IN
PACKAGING
AND SHIPPING

• Probably in no area of the chemical industry are there more opportunities for cutting costs than in materials handling, packaging and shipping. Consequently, under greater pressure for production economies to meet stiffer competitive conditions, manufacturers have sought to streamline materials handling programs and have re-examined packaging and shipping practices.

Increased use of mechanical means of moving raw materials into the plant, along the production line, through the packaging operation and out of the plant as finished products has replaced slow and expensive hand labor. Many companies that never before had a formal materials handling department have established one; others have given such groups the authority and personnel needed to carry out this vital work properly.

The trend to mechanization has been particularly noticeable along the packaging line as producers have sought greater speed combined with accurate weight and secure, attractive packages. Here, the small manufacturer seeking a means of competing with large producers, has become a good customer for all types of automatic equipment.

In packages as in other materials, shortages have given way to adequate supplies, and producers of chemicals no longer have to take whatever is available to satisfy packaging requirements. This has resulted in more careful attention to both the kind and size of container that is selected for a particular job.

The following reviews by men with much experience in packaging, shipping, and materials handling in the chemical industry point out the new packaging developments that are solving new and old problems, and show how new techniques can save money for a chemical company. A staff review of filling equipment draws attention to new devices developed to aid mechanization of the packaging function.

MISCELLANEOUS PACKAGES

by T. PAT CALLAHAN,
Supervisor of Containers
Monsanto Chemical Co.

WITH the complete return or all types of miscellaneous packages to use in the chemical industry after several years of substitution when particular packages were in short supply, the outlook is very bright for many improvements during the coming year. Miscellaneous packages, which include primarily containers fabricated from materials other than metal or glass or wood, are comprised chiefly of multiwall paper bags, fibre drums, and fibreboard boxes. Use of this type of packaging in the chemical industry has shown tremendous increases during the past two years and further gains are anticipated. The three major requirements for a container of any type in the chemical industry are safety, economy and appearance, and miscellaneous packages made from paper products when properly designed and constructed fill all three of these requirements.

Multiwall paper bags have grown in use and are meeting many new packaging problems, particularly for dry powders. Technological improvements in the design and construction of multiwall paper bags coupled with research by the larger companies to produce superior sheets of kraft have made the multiwall paper bag a safe and economical container in which to ship a wide variety of dry chemical products.

Recently developed special plastic coatings which have been produced by the manufacturers of multiwall paper bags will, during the coming year, be used more and more in packaging materials which are hygroscopic and need moisture protection. It would appear at this writing that development of such plastic coatings will expand the realm of multiwall paper bags by permitting shipment of items which must be protected from contamination and moisture.

FIBRE DRUMS

Wherever rigid containers are required in shipping powdered materials, the fibre drum has proved to be the most acceptable means. Fibre drums are constructed in varying sizes from one gallon to seventy-five gallons and can be obtained in standard constructions or special constructions dependent upon the net weight packing required. Specially lined interiors which impart additional protection against contamination are obtainable in fibre drums as are grease-proof, stain-proof and chemical-resisting treatments.

Since further development of various types of construction along with improvement in linings and coatings is currently under way, the possibility of using fibre drums more extensively than in the past for pastes and viscous materials is enhanced. Not only pastes and viscous materials, but even liquids may be shipped in specially lined and constructed

fibre drums. When tests have been completed and sufficient experience gained in handling these shipments, the chemical industry will undoubtedly ship many such products in these containers.

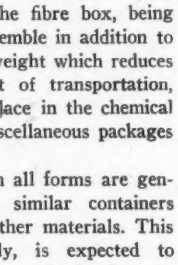
FIBREBOARD BOXES

Considerable progress has been made during the past year and further progress is anticipated during the coming year in further developing fibre boxes for chemicals. Larger unit fibre boxes than formerly used for packaging chemicals are being constructed, and there is reasonable assurance that fibre boxes capable of carrying a thousand pounds or more of dried material may be developed during the coming year. The fibre box, being rigid and easy to assemble in addition to carrying a low tare weight which reduces considerably the cost of transportation, has a very definite place in the chemical industry so far as miscellaneous packages are concerned.

Paper containers in all forms are generally cheaper than similar containers manufactured from other materials. This advantage, principally, is expected to result in even wider use of miscellaneous packages for chemical products.

METAL DRUMS

by PHILIP P. KENNEDY
Consultant, Engineering Department
E. I. Du Pont de Nemours and Co.



METAL drums have been in easy demand during most of the past twelve months with a corresponding easy supply. The supply is not expected to tighten seriously unless a prolonged steel strike occurs, as present sheet steel inventories in drum manufacturers' plants should be sufficient to carry fabricators through a short period of steel mill shutdown.

As indicated a year ago, further developments have been made on the use of stainless steel containers, especially of a size to replace 13-gallon glass carboys for commodities for which stainless steel is satisfactory. Of particular interest is the 15-gallon stainless steel chemical container developed by the Heintz Manufacturing Co., Philadelphia, with the cooperation of a committee from the Manufacturing Chemists' Association, which container is now in production. This chemical container is a bilge type three-piece construction consisting of two drawn cup-shaped heads and a center body section. Rolling hoops are expanded in the body section and the three pieces joined by circumferential welding. The top and bottom heads are designed so that the bottom of one drum will nest on the top of another, thus facilitating stacking in storage and during shipment. The drum is equipped with one 2" opening in the top head near the periphery with the head designed to enable complete discharge of drum contents. The container is fabricated from 16 ga. Type 304 stainless steel and has a tare weight of 24 pounds. Specification I.C.C. 5-C is currently being amended to include this container. The expected long life of such drums coupled with low tare weight and small maintenance cost indicates an economical replacement of glass carboys with increased safety in handling and transportation.

DRUMS FOR NITRIC ACID

When considering stainless steel containers for corrosive products, it will be well to note a modification to paragraph 3 (b) of Specification I.C.C. 5-C which will be published in the forthcoming I.C.C. notice. This amendment permits the use of Type 304 stainless steel drums in the *as welded* condition for nitric acid concentrations up to and including 78% but for higher concentrations drums made of Type 304 must be *heat treated,* or stabilized Type 347 in the *as welded* condition may be used. Mention is made of this as very few of the drum fabricators are equipped to heat treat drums after fabrication and it will be advisable to test welded sections of the several types of stainless steel with the range of concentrations in which the commodity is shipped to assure freedom from trouble.

The research program on coatings for steel containers fostered by the Steel Shipping Container Institute has been progressing steadily. This program, established at the Battelle Memorial Institute, has established the effect of metal surface conditions on coating performance and has evaluated various surface pretreatments with the objective of obtaining optimum coating performance with coating materials in common use. It has been shown that for coatings to resist impact, a certain degree of surface roughness is essential and must be accompanied with control of dry film thickness. Best results have been obtained on blasted surfaces giving a 35-50 reading on a physicist's profilometer. The required film thickness varies with different types of coatings and must be controlled accordingly. The program is now in its third phase; namely, the evaluation of methods for obtaining the required surface pretreatment and investigation of less widely used coating materials and systems which might obviate the necessity for surface treatment and still result in coatings with good physical and chemical properties.

Further progress has been made by the Manufacturing Chemists' Association in its study of methods for the stowing and bracing of carboys in railroad cars. Five different types of bracing have been investigated, these being in brief: (1) solid loading with carboys turned to fill out space, and wood bracing; (2) solid loading with no carboys turned, and wood braced; (3) solid loading with steel strapping anchored to car; (4) step-down loading, each tier being secured with steel strapping anchored to car; and (5) floating load bound by steel strapping. Results of this work will be incorporated in a manual soon to be published and released by the Association.

GLASS AND WOODEN CONTAINERS

by G. W. BENBURY, Manager
Packaging and Labeling Division
Pennsylvania Salt Manufacturing Co.

ALTHOUGH glass continues to be the preferred container material for fine chemicals and pharmaceuticals, and is commonly used for the shipment of many commercial chemicals, there is growing evidence that other materials, incorporated in packages of more recent design, may gain prominence. Bottles made from the newer plastics are finding places for specialized uses, particularly in the consumer field. Moreover, the newly developed stainless steel containers in the 15-gallon and 20-gallon sizes and carbon steel drums with flexible, chemical-resistant liners in sizes from 5 gallons to 55 gallons, are reported to show advantages on a weight basis as well as an economic advantage over the boxed glass carboy.

Developments in glass packages have centered chiefly around improved methods of protection during shipment, new materials and new designs for closures, and advancements in techniques of producing applied color labels. There are now available several types of venting closures for a wide range of bottle openings. In addition, greater application has been found for polyethylene caps, especially on glass bottles entering the consumer field.

The downward trend in production of glass containers in 1948 continued into 1949, although it is reported gains were fairly steady in the first half of 1949 on certain lines, primarily food, toiletries and cosmetics containers. Insofar as

chemical containers are concerned, the improved availability of steel for cans and drums has influenced the reduced demand for glass containers, especially for certain products that had to be packaged in glass as a result of war-caused metal shortages.

PLYWOOD-ENCASED CARBOYS

One new development which has come to the attention of shippers within the past twelve months is a package designed by Seymour & Peck Co. for the shipment of 5 gallons and 6½ gallons of liquids. Essentially this is a cylindrical drum made of plywood, holding a glass carboy bottle properly protected by cushions fitted to the plywood drum. This package should be especially suitable for export service, since weight and storage space requirements are favorable.

The drum consists of a shell made from two pieces of two-ply wood in cylindrical shape, one within the other, to provide a four-ply wall. Plywood discs form the top and bottom, the top disc having a circular hole for the bottle neck, and both discs being held in place by wood liner strips nailed or stapled to the inner drum wall. If desired, the bottle may be completely enclosed by a taller drum with a second top full disc securely held in place.

Bottles may be conventional 5-gallon or 6½-gallon sizes. They are protected by cushions of either cork or rubber, arranged to avoid damage from shock.

The Formwood Container Corp. also has developed a carboy box of new design for use with a 13-gallon bottle. The box is of 5-ply construction using a thermosetting cement of the urea-formaldehyde type, the sides being formed in a mold to produce a square box with rounded corners and a butt joint held together with cement and overlapping internal nailed strip. Top and bottom are made from the same material, the bottom being held in position by cement and nails, the top being nailed in only. Properly placed cushions between bottle and box afford protection.

The laminated wood is hot bonded at 300° F. in a patented pressing operation with uniform applied force of about 500 p.s.i. It is reported the wood thus formed is resistant to moisture penetration and to attack by certain chemicals. In addition, there is claimed to be a weight reduction over the conventional 13-gallon nailed wood carboy box.

REAGENT BOTTLE BOXES

This manufacturer also has produced by a similar process boxes for the shipment of 5-pint bottles of reagent chemicals, the specially formed boxes for either six bottles or nine bottles being fitted with wood separators to produce cells for the individual bottles.

MATERIALS HANDLING

by R. M. AUDE
General Superintendent
Transportation and Materials
Plastics Division
Monsanto Chemical Co.

ALMOST significant trend in business today is the growing realization that materials handling is an extremely important cost factor. Estimates for materials handling vary between twenty and fifty per cent of total labor cost of manufacturing, representing an order of magnitude sufficient in many cases to make the difference between profit or loss. Tremendous savings are possible through organization, equipment selection, and methods studies. Proper equipment selection and good materials handling methods will result from good organization.

Too often, in the past, the easy-to-apply coolie principle has been used as work loads increased: more work—therefore, more men. Today, however, the coolie principle is much too costly and managements are recognizing the need for a materials handling organization, development work, and the systematic substitution of machine power for manpower. Most success in this work is being reported by those companies who early appreciated the interrelation between several formerly decentralized functions and who acted to centralize them!

ORGANIZER IS KEY

Key to the plan lies in selection of a competent man under whom to organize the work. He should be given not only the responsibility but the necessary authority to act. He must have top management backing. His position should be high in the organization to assure a voice in basic decisions.

All functions involving control over materials should be grouped in one department. To derive maximum benefit from a centralized Materials Handling Department, there must be early recognition of the two major goals: (1) to serve production needs safely and efficiently, and (2) to control materials handling costs. The organizational setup discussed below depicts the type of consolidation considered necessary for success. It is not theory—the organization is actually operating today at Monsanto's Plastics Division in Springfield, Massachussetts. In 1948 this organization was responsible for materials handling labor savings of $55,000 over previous decentralized operation — a 25% manpower reduction! Container improvements accounted for an additional saving of $30,000. Major Traffic Department contributions were in the field of commodity rate negotiations, shipment consolidation, and demurrage reduction.

FOUR DIVISIONS

While local conditions may require variation in organizational arrangement, the basic framework is generally applicable. The department is subdivided into four major sections, grouped under one head for functional purposes to take advantage of the close interrelation between the activities involved: (1) Traffic Management, (2) Material Coordination, (3) Technical Assistants, and (4) Materials Handling. Basically, an effort has been made to separate purely office functions from those predominantly physical. For example, Traffic Management is subdivided into the clerical functions of Traffic and those of Shipping which are primarily physical materials handling operations.

Material Coordination, or material control as it is sometimes called, is an office function on a professional level. This group has the responsibility for translating sales and production forecast information into materials and container requirements on specific delivery schedules. The information compiled is turned over to the Purchasing Department for vendor contact and purchase. Timing must be such that inventories remain under control within predetermined maximum-minimum limits.

Materials Handling, per se, comprises all allied functions concerned with the physical handling of materials through the successive steps of receiving, handling, warehousing, and transferring, until finally delivered to an operating department for conversion into finished goods.

TECHNICAL ASSISTANTS

Technical assistants work on the development of new materials handling techniques, container improvements, cost analyses, and the preparation of standard operating procedures. Handling special projects as staff assignments frees line supervision to discharge its primary responsibility of organizing the work and supervising the men.

The centralized organization, because it is closely knit, can make full use of advancement in types of equipment, containers, and techniques, since handling materials is involved throughout receiving, warehousing, transferring and shipping. All these activities can make use of the same basic principles made available through the Technical Assistant group. Contact channels through which

information must flow are direct, and red tape is at a minimum.

Tie-in of Material Coordination, Traffic Management (Traffic and Shipping), Materials Handling, and Technical Assistants is a step forward in industrial organization. Such consolidation leads inevitably to orderly planning, elimination of excessive time losses, bottlenecks, and unforeseen "emergencies." Most important of all—materials handling costs decrease!

FILLING EQUIPMENT

WITH greater mechanization of production in the chemical industry, there has been a correspondingly greater demand for more accurate control in filling and a swing to fully automatic operation. This trend has extended to small manufacturers, who in their efforts to compete with larger concerns, have sought more economical packaging methods. Machinery manufacturers have met this particular need with modified models of standard fillers to satisfy low production requirements. The following review of new or improved filling equipment developed over the past several years shows some of the types available to both large and small chemical producers.

Horix Manufacturing Co., Pittsburgh, Pa., has developed a modified model of its Rotary Filler which is designed to grow with production. The basic machine has 7 valves, hand feed and hand discharge, and is driven by a constant speed drive. As production increases, 7 more valves may be added or other types of valves secured for filling other products into various shaped containers. Later a variable speed drive can be added, as well as a discharge conveyor and automatic infeed, and eventually it can be converted to contain all the features of the standard automatic rotary filler, the Horix Model E Filler. This can be used for all types of liquid products.

During the past year, this company has also developed special fully automatic equipment for pharmaceutical products such as saline, dextrose and glucose intravenous solutions and nose drops. These fillers have had to be non-aerating, extremely accurate in operation, and so constructed that every part contacting the liquid could be sterilized with steam before each production run. For one of them, a special valve of stainless steel with no packing has been designed to meet the stringent filling conditions.

The Weigh Right Automatic Scale Co., Joliet, Ill., has supplied machinery embodying its patented stream flow principle, claimed to give accuracy not hitherto obtainable on conventional net or gross weight fillers, to handle a variety of chemical powders. Its Model A1 Pak King automatic was used to fill small jars and bottles with polyvitamin, yeast powder, etc. Equipped with special packing spouts and industrial vacuum drawoff and quick takedown features, its timing and vacuum had to be adjusted so that bottle screw threads and lip were clean to prevent sticky lids. Also adapted was a new design in side agitation of container by electronic controlled amplitude.

MODIFIED MODELS

Weigh Right's Model A Pak King with a special rotor and detachable top section was set up to handle a ¾ oz. bubble bath powder envelope by operating at an rpm below 40 to prevent gumming due to heat. Five machines fill 8 envelopes per second. In another application where filling tins with blue print chemicals was a bottleneck, because of close tolerances and ease of cleaning required, the same filler was modified with detachable wing nut top section, an added supply hopper, flange-type removable rotor, plated drum and parts, and a worm gear drive on the sliding scale to give more sensitive control of stream flow. Operating from a few grams to 8 ozs., short or long runs can be made, with washing a simple chore.

The same company's special Model B1 Pak King automatic with turret type mechanism solved a filling problem with cleanser powder which had to be accurately packed into standard 14-oz. canisters at a rate of 50 per minute despite a tendency to overflow the container because of variable density due to entrapped air. A pressure relief pipe entrance with baffles maintains constant density; the turret drop spouts prevent overflow. Sealed drives and vacuum outlet control this abrasive-type of powder.

The Automatic Whiz-Packer, among the latest developments of Amsco Packaging Machinery, Inc., Long Island City, N. Y., is a combination filling machine and endless belt conveyor for use with flat bottom containers. A rotating dial table in the center gently takes one container from the incoming side of the conveyor and feeds it, in correct timing under the filler spout, assuring a positive fill with no spillage. The filler spout seats itself gently on top of the container before the discharge to eliminate dusting. The dial table then continues its rotation, feeding the filled container to the outgoing side of the conveyor. Chrome plated rails act as a constant assistant to guide the containers. Other features include a no can, no fill device; variable speed drive; guards on all moving parts; and quick and easy change-over. The machine will feed from right to left or left to right. It is designed for powders, crystals, seeds and the like.

BELT CONVEYOR

Another addition to the filling line is Amsco's Hopper Field Conveyor, an endless belt conveyor equipped with scoops, buckets or cleats closely synchronized with a variable speed control and an adjustable throat opening in the bin for a wide product range. All moving parts are fully enclosed or guarded. It includes an automatic stop-start device to maintain constant hopper level and a wide feed range for small and large quantities. It is designed to eliminate shearing and breakage of the product with no spillage or leakage outside of the conveyor or bin. The entire belt and buckets are easily removed for cleaning with simple and ample adjustment for belt stretch. The bin is lined in stainless steel with smooth contours.

This company's Floor Model Whiz-Packer fills all type containers from the tiniest up to 10 pounds (depending upon specific gravity) with powders, crystals, seeds, flakes, etc. Speeds are up to 120 per minute. Accuracy is within 1/32 to 3/16 ounce depending upon product.

CARTON FILLER

Stokes and Smith Co., Philadelphia, Pa., claims that its new High Speed Neverstop Carton Filling and Sealing Machine is the fastest on the market. Entirely automatic, feeding printed cartons from a supply, bottom sealing, filling through adjustable measuring pockets and top sealing, at the rate of 160 to 220 per minute, this machine is particularly suited for products like granular soap compounds, cleansers, and other free-flowing materials. It is equipped with a slack fill detector and ejecting mechanism so that a package is automatically ejected from the machine if it is not filled up to the desired height.

In addition to this latest development, Stokes and Smith has also improved its various filling machines. These are made in various styles and sizes—semi-automatic and fully automatic—to satisfy various production requirements—15, 30, 60 and 120 per minute—and for filling a variety of containers. Particularly suited to filling powdered or dusty chemicals is the Auger-Vac equipment for these filling machines. This combination auger and vacuum mechanism draws a vacuum on the container, and fills the desired amount of product with the augerfeed, thus insuring a tight packing with practically no dust.

Arenco Machine Co., Inc., New York, N. Y., whose machines are built in Sweden and are widely used in this country, has brought forth new or improved filling equipment over the past two years. Its GAM Jar and Bottle Filling Machine will handle paint, varnish, oil and other liquids in volumes up to one liter. Capacity is 1200-1500 jars, etc. per hour. The VEN Weighing Machine handles granules or powder, minimum weight being 10 grams and the largest weighing volume, 250 cc. It makes 5-20 weighings per minute, depending on the size and tolerance, and fills 250-1000 containers per hour.

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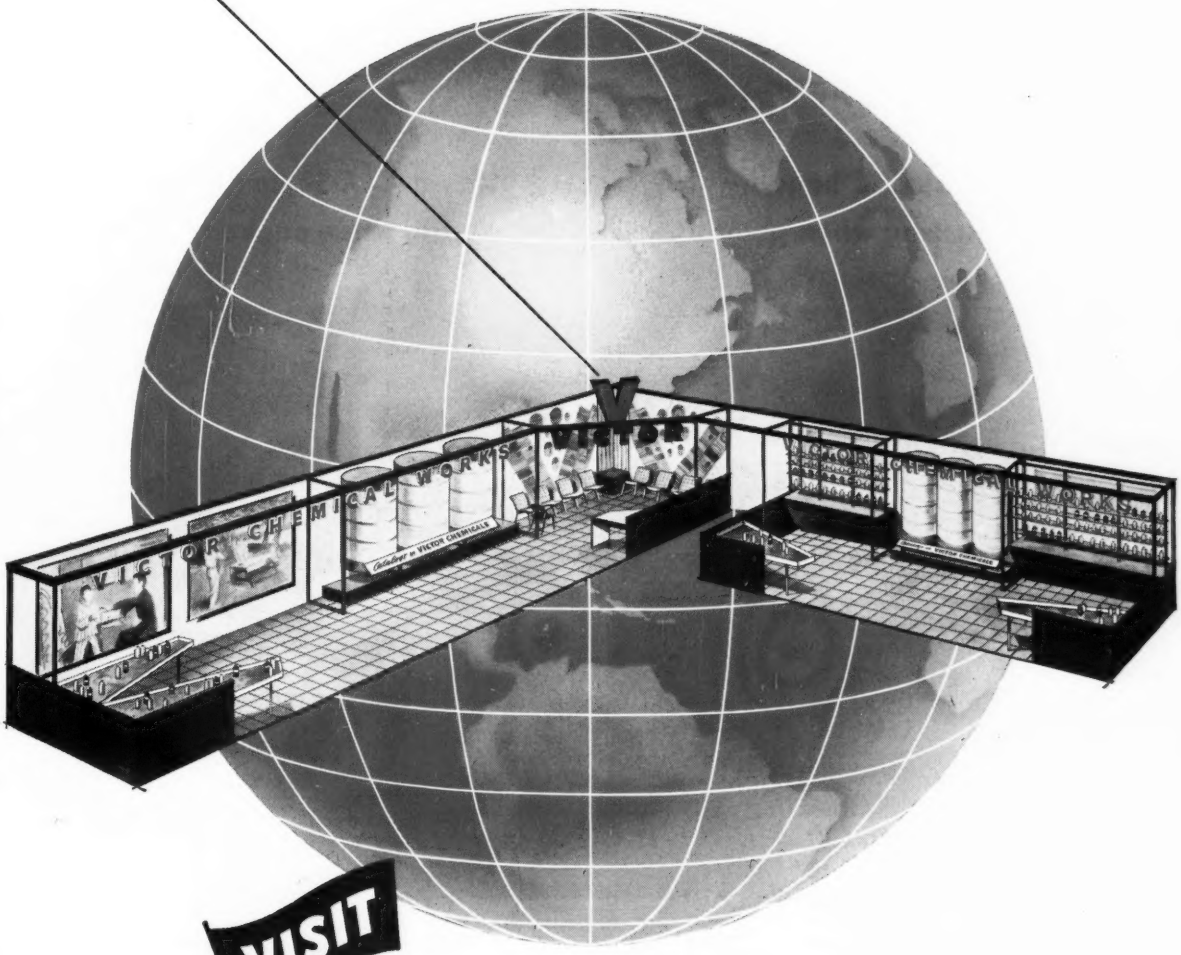

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SHUR-CLOSE Valve being placed on packing spout. Insertion of sleeves between plies guarantees quick placement on spout. No chance of valve catching spout.

Fertilizer, chemical, food product and flour plants all over the country are reducing dusting and sifting with the brand new SHUR-CLOSE Valve Bag.

Unlike ordinary valve bags, the SHUR-CLOSE overlapping valve action gives a quick, positive seal immediately after bags are filled. There's less dusting when packing and an absolute minimum of sifting when bags are packed.

Consumers are requesting shipments in SHUR-CLOSE valve bags because they prevent waste; while operating men in packing rooms claim SHUR-CLOSE bags eliminate objectionable dust in the packing operation.

If you pack fertilizer or chemicals, you should arrange immediately to have an A&S Packaging Sales Technician demonstrate SHUR-CLOSE Valve Bags in *your* plant using *your* filling machines.

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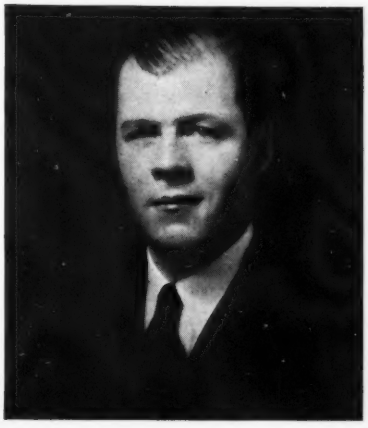
THE CHEMICAL PANORAMA

NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

PEOPLE

W. R. GRAHAM, JR., recently appointed director of research for The Quaker Oats Co.



JOHN E. McKEEN, formerly executive vice president, Chas. Pfizer, elected president.

WILLIAM F. HESTER, named administrator of the Koppers' fellowships at Mellon Institute.

F. H. Leonhardt (l.), president, Fritzsche Brothers, Inc., congratulates SIR JOHN SIMONSEN, winner of the Fritzsche Award for achievement in essential oils, at the 116th ACS meeting.

MEARL A. KISE, who has recently been appointed director of research and development of the Virginia Smelting Co., chemical manufacturers. Dr. Kise was previously assistant chief of research for the Solvay Process Division of the Allied Chemical and Dye Corporation.

KENNETH S. PITZER, director of research, U. S. A. E. C., to receive the Precision Scientific award at the ACS spring meeting.

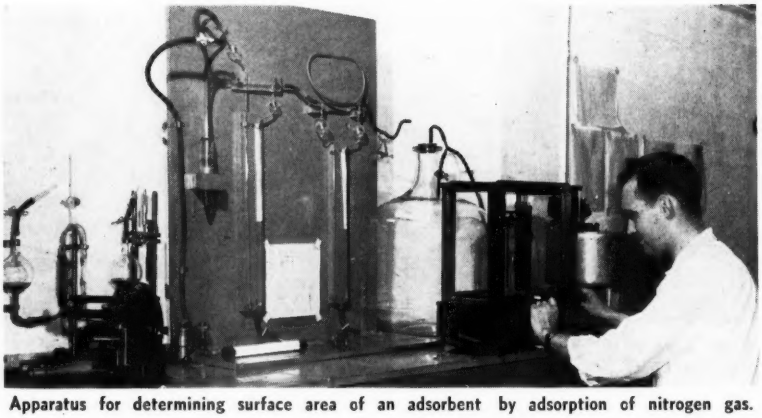
Central portion of the main Research Building of the Georgia Tech Engineering Experiment Station.

Micromeritics Lab

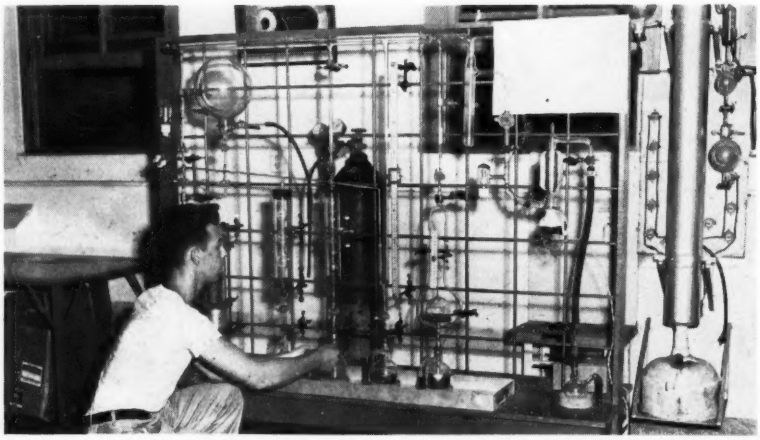
To meet a growing need for generally available research facilities for the study of fine particles and related problems, a completely equipped laboratory has recently been created by the Georgia Tech Engineering Experiment Station for research on the characteristics and behavior of fine particles—a field of technology which has come to be known as "micromeritics."

Accurate knowledge of the sub-sieve range of particles has become increasingly important in recent years. It is no longer adequate to express particle size as being "less than 325-mesh," "less than 400 mesh," or—as has often been the case—"very fine particles." Since particles behave quite differently as their size decreases, much depends on more adequate descriptions. At Georgia Tech, therefore, the micromeritics laboratory, under the direction of J. M. Dalla Valle, professor of Chemical Engineering and faculty research associate, has installed the facilities needed for measurement of particle size from the macroscopic to those less than 0.01 micron in average diameter.

Size and surface are intimately related. However, since the shape of particles of different substances is by no means uniform or similar, a simple linear measurement of "average diameter"—so often assumed to be sufficient—is not necessarily meaningful. "Surface" diameters and the



Apparatus for determining surface area of an adsorbent by adsorption of nitrogen gas.



Permeameter, which measures specific surface, surface per unit weight, of nonporous media.

How many ways do you use **Sodium Phosphates?**

V-C Sodium Phosphates are widely used in the manufacture of cleansers and detergents, and in water treatment. But V-C Sodium Phosphates also have countless other uses which make them versatile, dependable "work horses" of the chemical industry. Produced from phosphoric acids, made from elemental phosphorus, they are of the highest purity.

V-C DSP

V-C Disodium Phosphate is employed by the textile industry in dyeing, scouring, kier-boiling and boiling-off operations. It serves as a plasticizer in processing cheese; and is used in tanning; in ceramic glazes; in metal treatment; and in emulsifying condensed milk. V-C DSP, in an exceptionally pure Drug Grade, is extensively used in pharmaceuticals.

V-C TSP

V-C Trisodium Phosphate is one of the most widely used emulsifiers and water softeners. It also has special utility in asphalt emulsions; fireproofing compositions with ammonium salts; photographic developers; and adhesives.

V-C TSPP

V-C Tetrasodium Pyrophosphate is used in textile and paper processing; in the manufacture of ceramics; as a buffer salt in cosmetics and food products; and as an ingredient of insecticides and ink eradicators.

V-C STPP

V-C Sodium Tripolyphosphate with its sequestration properties is used in drilling fluids for mud treatment; in cold-water paints of the casein-lithopone type; in cement to delay setting time; in cheese manufacture; in textile and leather processing; as a dispersing and peptizing agent in clay purification; and in laundry cleansers.

These are only a few of the many uses which have made V-C Sodium Phosphates famous for their quality and purity. V-C Sodium Phosphates are as close to you as your telephone. Place your order today for shipment by rail or water . . . or 48-hour truck delivery in Middle Atlantic and Southeastern states.

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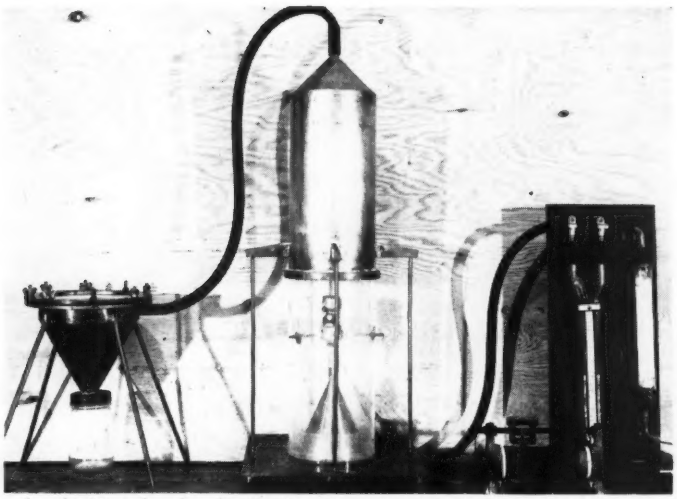
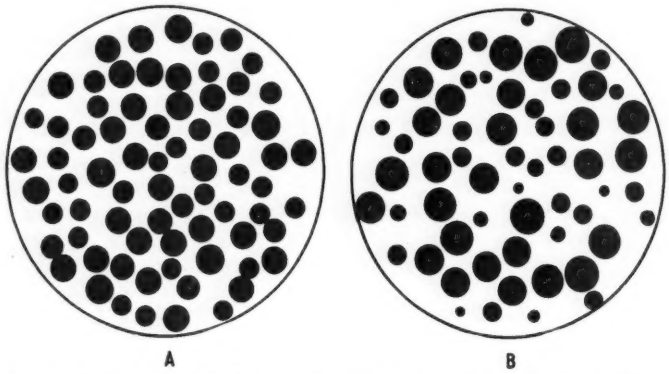
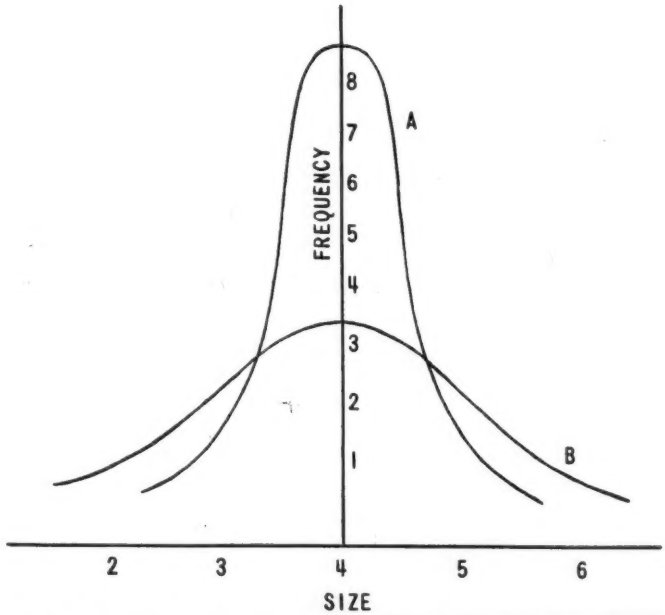


An elutriator, for the classification of powders into fractions of various sizes, with an air flow meter, stirring motor control, and an air-solid separator.

Flotation apparatus for density determinations of fibers.



Samples A and B both have the same "average" diameter, but show distinct differences in size distribution. This may be of considerable importance in their use.



Size distribution curves for the two samples shown above. Note that although both these samples have the same "average" diameter, sample A is the more uniform.

shape factors associated with them are of considerable importance in the fields of pigments, chemical reactions, catalysis, and others in which the surface afforded by fine particles is of primary interest. For use in investigation of such fields, the Georgia Tech micromeritics laboratory is equipped with suitable permeameters and a low-temperature adsorption apparatus for measuring specific surface, that is, the surface per unit weight or volume of the fine particles.

Because of the wide diversity of methods which can be employed for the determination of particle size and surface, and because of the various interpretations which can be placed on results so obtained, one of the goals which the Georgia Tech laboratory has set for itself is the coordination and improvement of methods now in use. Too much stress cannot be placed on the importance of this project, since the present lack of standardization is leading to much confusion in reproduction of published results.

Among the special studies currently being investigated are: (1) use of fine particles as carriers of chemicals for specific uses, such as insecticides and fire extinguishing agents; (2) diffusion and settling of fine particles, a study being conducted by means of an electronic conductivity device designed and constructed at Georgia Tech; (3) methods of separating particles of different kinds which have only slightly different densities; (4) aerosol problems, with reference to coalescence and aggregation; (5) separation of narrow size fractions, a most important problem in the field of chemical behavior; (6) determination of volume and shape factors; (7) void structure and specification of packings, a study being made with fibers; and (8) permeability investigations as regards the nature of flow when particles are extremely fine and closely packed.

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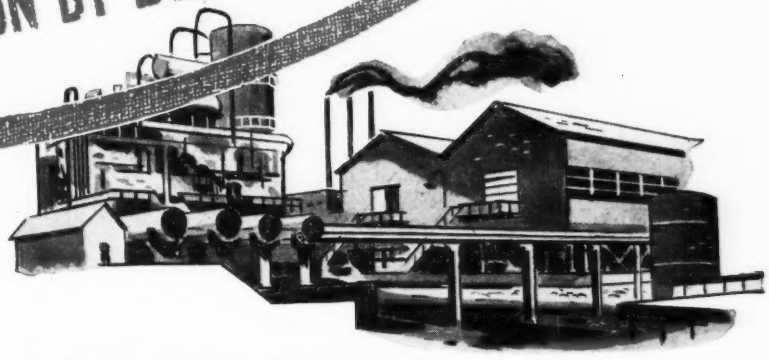

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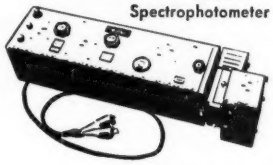
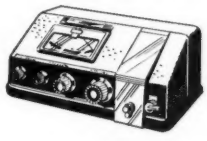
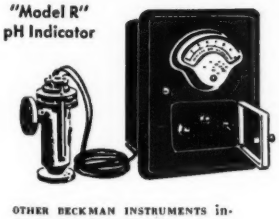


"Model B" Spectrophotometer



"Model R" pH Indicator



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ACS Awards

Bruce H. Sage, California Institute of Technology, receiving the Precision Scientific Co. Award for research in petroleum chemistry, presented this year for the first time.

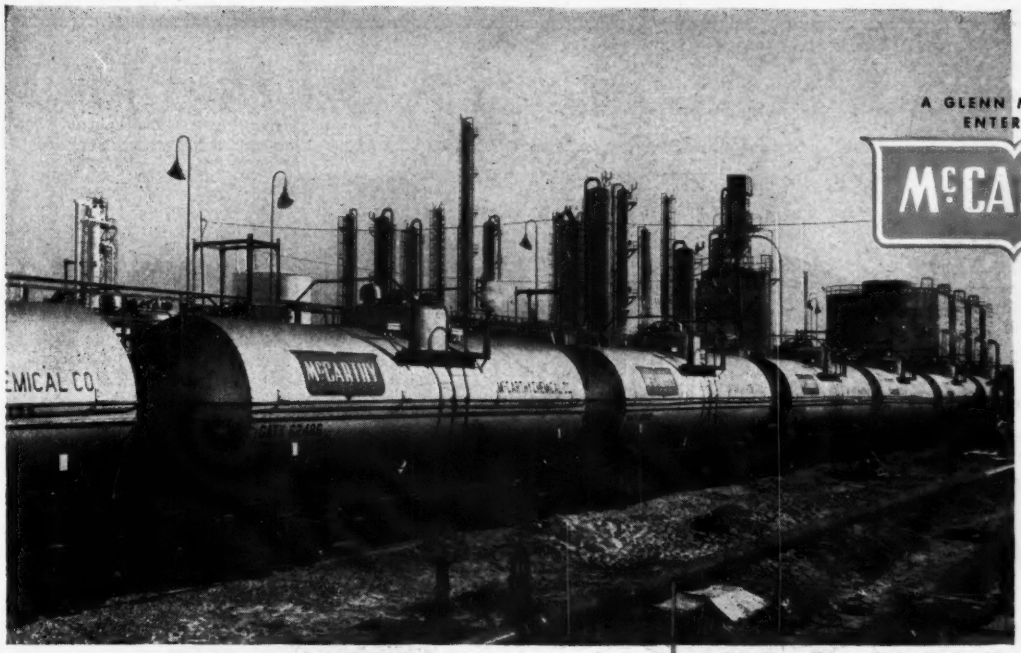
Linus Pauling presenting the Priestly Medal to Arthur B. Lamb of Harvard University.

Irving Klotz, Northwestern U., receives the Eli Lilly & Co. Biological Chemistry Award.

George R. Greenbank, Bureau of Dairy Industry, is presented the $1,000 Borden Award.

Henry A. Lardy, University of Wisconsin, receives the Paul-Lewis Laboratories Award.

Nine awards for outstanding achievements in chemistry were presented at the 116th meeting of the American Chemical Society held in Atlantic City in September. The new Precision Scientific award and Fritzsche award (*see p. 541*) were given for the first time. Over 8,000 members and visitors attended the meeting.



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Ammonium Citrate Dibasic	Cleaning and Plating of Metals	Removes rust and scale.
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Calcium Citrate	Construction	Slows the setting of cement and plaster.
Triethyl Citrate Tributyl Citrate Acetyl Triethyl Citrate Acetyl Tributyl Citrate	Plastics Industry	Plasticizers for a wide variety of synthetic plastics.
Itaconic Acid (Citric Acid less CO_2+H_2O)	Paint and Varnish Industry	Shortens reaction time, gives harder finishes, improves color, shortens baking time of oil modified alkyds.
Itaconic Acid	Plastics Industry	Condensed with glycols or simply esterified, may be polymerized to form clear hard plastics.
Aconitic Acid (Citric Acid less H_2O)	Plastics Industry	For preparation of synthetic resins and plasticizers.
Tributyl Citrate	Textile	Anti-foaming agent.

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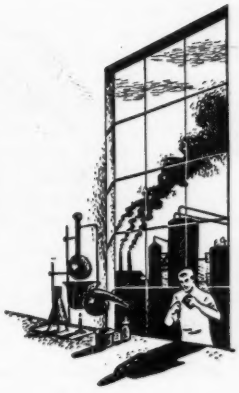

• No facet of the chemical industry is more responsive to consumer reaction than chemical specialties. With all lines becoming more competitive, specialties manufacturers have spurred efforts to find wider applications for their products, and have sought new chemical raw materials to make them better and cheaper.

Basic chemical suppliers have worked closely with this $3.4-billion industry to help it attain its goals. Many major companies not only are interested in supplying chemicals to such manufacturers, but they also produce and sell both household and industrial specialty products themselves. Research by all groups in the field has been a leading factor in its growing importance in the industrial picture.

In Chemical Industries' fourth annual survey of New Specialties, over 200 new products bear testimony to the progress that has been made over the past year. The following reviews by experts in the various segments of the field outline the year's significant marketing conditions and technical developments, point to trends that will shape the future.

LEATHER CHEMICALS

by A. H. WINHEIM, President, American Leather Chemists Assoc. and Planetary Chemical Co.

THE leather industry faces the stark fact that 42% of this year's shoes carry plastic or other non-leather outsoles. The largest and lushest leather maret continues to slip.

Sources of tanbark and other vegetable tanning materials are dwindling and prices of these materials are rising; labor costs have mounted; a tough competitive selling situation is being encountered due to the encroachment of improved man-made polymers.

But the plight of the tanning industry in 1949 is far from hopeless. Working with a by-product of the meat industry, it enjoys a unique position. On the one hand, it is assured of a source of basic raw material at a price which sale of the finished product will justify. A market for animal hides must be maintained.

On the other hand, the potential volume of the finished product is relatively static. Up to the present, at least, skin-like structures have not been synthesized. Hence, the amount of leather produced is dependent upon the amount of meat we eat.

The potential volume of leather chemicals required, however, is not static. The tanning industry is undergoing a "face-lifting." Today, with chemistry playing an increasingly important role, tanning is attaining new vitality and envisions products possessing a controlled variability. Tomorrow, new leathers—durable leather bridging the gap between plastics and the leathers of yesteryear—will find expanded and new fields.

POLYMERIC TANS

Holding the spotlight during the past year was progress made with what might be termed polymeric tannages. Included are those tannages variously referred to as replacement syntans, chemical tans and resin tannages.

Leather is truly a phenomenon of polymers. The fundamental unit of leather making, the protein collagen, consists of poly-condensed amino acids. Combined with this building block during the tanning process are vegetable tanning agents, usually poly-condensed phenolic substances.

The earliest American syntan which gave promise of replacing vegetable tanning materials was Rohm & Haas' Orotan. During the past year, evaluation of this product under actual plant conditions was subsidized by the Office of the Quartermaster General. Results showed that this phenolic condensate could displace natural vegetable extracts although current tan unit costs favored the natural product. Related replacement syntans (Novolak type of phenolic resins and resorcinol—aldehyde polymers condensed with sulfite cellulose) which have been subjected to commercial use include Chemtan Corp.'s "Chemtan" and International Leather Chemicals' "Intan."

Commercially acceptable upper leather and excellent chamois-type garment leathers, nearly white in color, have been produced by a tannage based on Du Pont's "Skelt." This product, made by the Reed process, consists of sulfonyl chlorides

of aliphatic hydrocarbons, reputedly to be principally of 16-carbon chain length. Fundamental research and development work with related products has been carried on for the past three years by J. B. Brown and associates of Ohio State and by Fred O'Flaherty and W. T. Roddy of the Tanners Council Foundation Laboratory at Cincinnati. Recently, tannage has been effected with these materials without the conventional use of formaldehyde as recommended by the Germans.

Grasselli's "G-942," a copolymer of maleic anhydride and styrene, and American Cyanamid's "Tanak MRX," a trimethylol melamine, are resin tannages being used to produce durable white leathers possessing extreme suppleness. The exact mechanism of these procedures has not yet been ascertained.

A tannage involving polymer formation of resorcinol derivatives within the skin structure is being evaluated but, to date, has not been formally described by the discoverer.

The Dialdehyde-Resin tannage, jointly developed by Doherty and Winheim, involves a two-stage reaction. Tannage is effected by glyoxal or other water-soluble dialdehyde. Subsequent treatment with resin-forming monomers results in chemical bonding of resin in the dialdehyde-tanned leather. Urea, formaldehyde and blocking agents produce a low-cost prepolymer possessing a controllable degree of flexibility. Recent refinements have eliminated the need for the acid-vapor chamber originally used to accelerate polymerization.

VEGETABLE TANS

The tightening supply situation in domestic vegetable tanning materials has prompted consideration of extending available materials by (1) increasing the harvest of domestic materials such as pine, Douglas fir and California tanbark oak (Report of E. S. Flinn); (2) starting plantings of willow, chestnut, sumac and canaigre; (3) using syntans, sulfite cellulose, lignin sulfonates and other adjuncts with the vegetable extract.

Vegetable tanning materials loom large, both on weight and value bases, in the leather industry. According to Flinn and Bell (Chemical Market Research Association Meeting in St. Louis, June, 1949), over 586 million pounds of vegetable tanning materials are used annually in the United States. The total of all other tanning materials, currently, is 123 million pounds per year. During the 1946-1948 period, these annual volumes represented dollar values of $41 million and $8.4 million, respectively.

Improved methods of extracting tannin from canaigre were reported recently by Rogers and Luvisi of the Eastern Regional Research Laboratory. Clarke and Luvisi are continuing their work with Sicilian and domestic sumac. Shuttleworth of the Leather Industries Research Institute of South Africa has proposed a new structure for quebracho tannin.

A progress report was recently released on investigations of tannin and secondary products from oak slabs. Red and white oak slabs from 20 scattered mills averaged 4.5% tannin. In a commercial scale test on 140 cords, recovery of 2.8% tannin was obtained, at a production cost of 16¢ per tan unit. Good yields of furfural, high-sugar molasses for stock feeds and high-protein fodder yeast were also obtained.

The Institute of Paper Research and the Tanners Council Foundation Laboratory (Lollar, Kremen and Salvesen) have investigated fixation of lignin sulfonates by collagen and have successfully tanned hide substance with some of the lignin derivatives.

MINERAL TANS

Many leather chemists agree that the mechanism of tanning differs with different tanning agents. Such variations in tanning mechanism and effects of compounds on hides partially account for the variety of tanning materials.

E. R. Theis, E. J. Serfass, T. C. Thorstensen and R. K. Agarwal reported during the past year on studies of the structure of complex chrome compounds by means of exchange resin techniques. They proposed the following order of ease of penetration of various anions into the complexes: oxalate, citrate, tartrate, glycolate, acetate and formate. These findings were later confirmed at Lehigh by means of the spectrophotometer.

Stratographic analyses of chrome-tanned leather have been carried out in detail by the Lehigh workers and by Klanfer and Associates (Cortume Carioca, Rio de Janeiro).

With the classification of chromium as a critical material by the military planners, impetus has been given to development of acceptable iron and alum tannages. Under the direction of S. J. Kennedy of the Office of the Quartermaster General, attempts are being made to stabilize iron-tanned leather. Chambard and Lassere of France report that normal iron tan liquors are stable only in a moderately acid state—more acid than the optimum tanning range. They found that formic, acetic, propionic and butyric acids all imparted varying degrees of stability to the leather. A silica-iron combination tannage has produced some interesting results.

Zirconium tannage, developed by Turley and Somerville of Rohm & Haas, has now been established commercially. Although more expensive than chrome, it is used for premium white leathers.

Alum tannages involving the use of masking agents present promising results. Work is continuing at the Eastern Regional Research Laboratory.

A modified mineral tannage has been developed by leather chemists who will soon report their findings before a meeting of the American Leather Chemists Association. The leather possesses plumpness and improved resistance to alkaline deterioration.

FUNGICIDES

Although fungicides and preservatives account for an annual outlay of less than one-half million dollars by the leather industry, there is an urgent need for such materials under certain conditions.

Kanagy, Charles and Abrams of the National Bureau of Standards last year reported their evaluation of the fungicidal properties of many compounds. They selected paranitrophenol and pentachlorophenol as two of the most effective fungicides and reported that the activity was enhanced when used together. Specifications for a dressing of this type were subsequently adopted by the Army.

Use of organo mercurials, such as phenyl mercuric borate, was favorably reported by Prendergast of England. Copper-8-quinolinolate, 8-hydroxy-quinoline, tetrachloro-*p*-benzo quinone and 2,3-dichloro-1,4-naphthoquinone are among compounds possessing fungicidal properties and other commendable attributes. Evaluation of these materials has not yet resulted in wide-scale applications.

FINISHES—SOLVENTS

Aqueous dispersions of many film-forming resins have been successfully employed in coating and finishing upper leathers, garment leathers, bag leathers, and upholstery leathers. Although introduced prior to the current year, those used most widely are the acrylates, the vinyl chlorides, vinyl alcohol, synthetic rubber latices, and various copolymers.

Acetone and other low-cost solvents for vegetable tannins are receiving renewed interest. Some tanners may use solvent tannages within a few years.

IMPREGNANTS

The work of Cheronis and his associates in improving the water-repellency of finished glove leathers with silicones and silanes is noteworthy. Oehler and Kanagy of the NBS Leather Section have achieved similar results on heavier leathers with rubber impregnations.

Replacement fats, homologues of the German Immergans and Derminols, have

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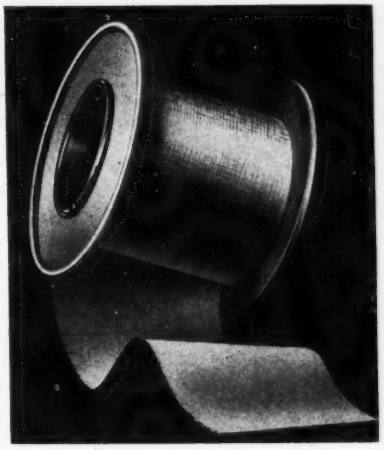

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captured the interest of the Army for military leathers. Work by Brown of Ohio State, Roddy of Cincinnati and Schubert of Eisendrath Tanning Co. has shown much progress.

Hesitancy to divulge developments on the part of some workers within the industry accounts for many obvious omissions in this brief review of the year's new work. It should be evident, however, that the market warrants increased interest on the part of the chemical industry. Although the value of the raw hides represents 54-60% of the total product value, over $94 million was expended annually during the 1946-1948 period for leather chemicals.

AGRICULTURAL CHEMICALS

by MELVIN GOLDBERG
Pesticide Advisory Service

THE volume of chemicals moving in the agricultural pesticide field has been the most significant factor in agricultural chemicals during the past season. Severe infestations of insects attacking cotton and corn, combined with a serious threat of grasshoppers in the midwestern states, were responsible for record use of insecticides. Formulations of benzene hexachloride and DDT as well as toxaphene (chlorinated camphene) were used for controlling cotton pests, while DDT plus quantities of parathion were used in corn borer work. Chlordane, toxaphene and sodium fluosilicate baits were used in grasshopper control.

Prior to this season, there had been appreciable drops in the price of various raw materials, caused for the most part by over-production, heavy carryover from the previous season and no indication of infestations. However, when the bugs did hit, there were shortages and, in fact, a black market in the field at the time infestations were heaviest.

RESTRICTIONS ON USE

An important event which may change the entire complexion of the agricultural insecticide field was the prohibition by various Federal agencies of the use of many chlorinated hydrocarbons for control of insects around dairy cattle and on plants likely to be fed to animals being finished for slaughter. This was to protect milk and meat from possible contamination. In the spring of 1949 insecticide manufacturers had to change labels to correspond to the regulations promulgated as a result of this fear of toxic residues, and the midseason was one of frenzied activity. This action accelerated the use of methoxychlor (the methoxy analog of DDT), and pyrethrins and synergist combinations, and ultimately resulted in commercial availability of Lindane, the 99% gamma isomer product of benzene hexachloride, for such applications. The latter product is free from a great deal of the musty odor characteristic of previously available BHC and also from the other isomers produced in the manufacture of benzene hexachloride that are responsible for toxicity to warm-blooded animals.

Another indication of how government regulations may cause changes in this field, can be seen in the effect of the announcement of residue tolerance hearings by the Food & Drug Administration after the first of the year. Some in the industry feel that until the hearings are completed, a damper may be put on the development and introduction of new products.

There are other organics including organic phosphates which found considerable use during the past season, and compounds 118 and 497 were introduced on a large-scale experimental basis.

PYRETHRUM SYNTHESIS

There has been considerable interest in the synthesis of pyrethrum-like esters and already several companies have experimental samples available. Accelerated production is under way because of the increasing threat of short supplies and corresponding high prices for the natural product for the coming season. While pyrethrum has been for the most part priced out of the agricultural field, it is finding increasing uses in other outlets, particularly in low-pressure aerosol bombs for specialty jobs. Combinations of pyrethrum and rotenone, and pyrethrum and pyrethrum synergists, however, are being introduced for agricultural use.

The insecticide season was marked by further discovery of strains of insects resistant to some of the newer organics. Previously, strains of DDT-resistant flies and other insect pests were observed but now it appears that this resistance has apparently spread to other materials and insects. It is being brought home more forcibly to organic chemists that newer compounds have their limitations.

WEED KILLERS

The use of chemicals as weed killers was characterized by the introduction of several newer materials to supplement 2,4-D. New products introduced were trichloroacetic acid and 2,4,5-trichlorophenoxyacetic acid used alone and in combination with 2,4-D in some cases. The volume of 2,4-D used during last season was disappointing because of the rather late season and regulations by government agencies as to how the maerial could be used. Price of the material declined due to heavy inventories from the preceding season as well as over-production at a time of decreased use.

The decline in the price of metallic copper and the corresponding decrease in the price of copper chemicals used in agriculture as fungicides once again enlivened competition between copper and the organic carbamates. However, the extended drought, particularly in the northeastern area, and the uncertain economic picture, particularly on potatoes, contributed to a decline in use of fungicides during the season. The lack of late blight, for which copper is generally used, accelerated the use of organics. Copper sulphate as an agricultural fungicide is generally becoming less popular with its place being taken gradually by neutral or fixed copper sulphate and the organics.

INDUSTRIAL CLEANERS

by H. R. SUTER
Associate Director of Research,
Wyandotte Chemicals Corp.

AMONG the notable developments of the past year are the use of sodium carboxymethyl cellulose in detergents, continued growth in the use of quaternary ammonium germicides, and the application of radioactive isotopes in detergency research. The upward trend in usage of synthetic detergents in industrial cleaning operations of all types has continued.

LAUNDERING

Probably the most significant development during the year has been the remarkable increase in the use of sodium carboxymethyl cellulose, a potent synergistic agent for increasing the effectiveness of synthetic detergents. In the power laundering field, products employing sodium carboxymethyl cellulose in conjunction with built synthetic detergents have become firmly established. The high performance properties of these synergistic products have permitted laundries to take advantage of the points of superiority of synthetic detergents with respect to soap, such as hard water tolerance, effectiveness at low temperatures, and freedom from accumulation of residues in fabrics, while maintaining quality standards at equal or higher levels than with soap.

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A clear, amber, 25% active liquid, slightly modified for unusual performance—ready to use—packed in non-returnable open-head drums.

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A uniform 40% active flake—light in color—mild in odor—excellent detergency, wetting and foaming qualities—low in dust content.

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Low in salt content—85-87% active flake—light in color—low in odor—extremely economical—excellent for export.

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Improved washing techniques, especially suited to these products, have been developed. The use of sodium carboxymethyl cellulose is being extended to general purpose cleaners and other specialized detergents.

SANITATION

Emphasis on sanitation from the standpoints of fundamental research, application research, and public education has increased during the past year. The National Sanitation Foundation is carrying on important work, with representatives of industry, public health agencies, and educational institutions participating, in the formulation of improved standards and practices. Acceptance and usage of quaternary ammonium germicides is steadily increasing. Notable improvements have been made in the formulation of detergent-sanitizers, the most successful of which are based on quaternary ammonium germicides and non-ionic detergents. It has become a recognized fact that while the ultimate in sanitizing may be achieved by thorough cleaning prior to application of the sanitizing agent, as a practical matter it is advantageous to keep the bacteria count in the wash water at the lowest possible level by the use of detergent-sanitizers, thereby decreasing the bacterial load in the final sanitizing operation.

In commercial dishwashing, automatic detergent feeders which maintain the washing solutions at optimum concentrations have come into use.

Among the newer developments in the field of detergents for glass and ceramic ware is a series of inhibited detergents which have greatly reduced rates of attack on these surfaces.

METAL CLEANING

In the metal cleaning field the trend has been toward greater specialization. Use of automatic equipment with high production rates, along with the increasing difficulty of cleaning due to the introduction of more tenacious drawing compounds, lubricants and rust inhibitors, has intensified the performance demands. Acid cleaners are being more widely used. Removal of finishes from rejected or damaged parts has also become more difficult because of improvement in surface finishes. This, along with increased activity in the maintenance of aircraft, in which case the finishes are stripped without disassembling, has added impetus to the use of solvent type paint strippers.

RESEARCH

A considerable amount of research effort has been devoted to development of performance tests in evaluating detergents. Because of the complexity of the problems involved, as well as the diversity of conditions and limitations in cleaning operations, such methods are applicable only within limited fields. In general, laboratory methods for evaluation of detergents for washing textile fabrics are the most highly advanced; however, they have not yet won industry-wide acceptance. Several scientific and trade societies are actively engaged in promoting such work. Much research activity is being directed toward developing laboratory evaluation methods for dishwashing detergents, in a few cases with sponsorship by Federal agencies which are interested in establishing procurement specifications.

Development of testing methods for specialized metal cleaning detergents is still less advanced. This is readily understandable in view of the wide variety of surfaces to be cleaned, of soils, and modes of operation. By and large, such work with this class of cleaners is done empirically, by the use of actual production specimens in the laboratory, and with a considerable amount of experimental testing on full scale installations.

In the field of fundamental research on principles of detergency, the most significant development has been the initiation of long range investigations with radioactive isotopes. This is being actively pursued in several laboratories and some work has been published. This work will undoubtedly lead to a better understanding of the surface phenomena involved in cleaning operations and may result in some badly needed measuring tools which might be expected to be useful in application research on detergents.

INDUSTRIAL ADHESIVES

by C. G. CALDWELL
Director of Research,
National Starch Products, Inc.

ADVANCES in industrial adhesives during the past year have been primarily along the lines of new applications, new techniques, and further exploration of the infinite variations afforded by synthetic polymeric materials. The period of shortages of basic materials is past and a trend to lower prices for certain of the synthetic resins may be expected with improved production methods.

Of particular significance have been numerous publications devoted to the nature of adhesion and to methods of measuring adhesion. Studies on adhesion of polymers to various surfaces are leading to quantitative information on the contribution to bond formation of a number of physical factors, including dielectric constant of the polymer, dipole moment of polymer constituents, the possibility of hydrogen bonding between polymer and surface and the mobility of polymer chain segments. Clearly foreshadowed is a more scientific tailoring of adhesives for the specific job to be done.

HOT MELTS

In the packaging field, new emphasis is being placed on the application of thermoplastic heat-seal adhesives in the search for greater speed of operation and cost-cutting simplification. Application may be direct, to effect an immediate bond, or indirect as in applying a tack-free film which is subsequently activated by heat at the time of bonding. An example of the latter is the machine application of precoated labels to various surfaces. Delayed action or tack-retaining types may be used to permit greater flexibility of operation. Fast setting types are desired for precoating such items as folding cartons and corrugated shipping cases where an immediate strain is imposed on the adhesive bond. Use of heat-seal papers and boards effects large savings because it eliminates purchasing, storing and handling adhesives, and setting up and cleaning machines, and it simplifies the packaging line.

Another new application is in binding books. Here, in addition to the improved bond and freedom from mold, the instant setting of the bond eliminates the twenty-four-hour conditioning period formerly required wth animal glue, and consequently saves time, space and handling.

EMULSIONS

Not only have resin emulsion adhesives expanded tremendously at the expense of vegetable types in all kinds of applications where superior bonding and handling properties are desired, but there also is a new trend for these materials to replace lacquers in fabricating transparent sheetings and in laminating them to paper. Their advantages are freedom from fire hazard, faster set, freedom from bleeding and freedom from thickening and stringing in the glue pot.

The simple coating of board and paper with polyvinyl acetate emulsions to produce grease-proof films promises to compete with the more complicated lamination processes.

THERMOSETTING ADHESIVES

Production of resin-bonded wood waste board is rapidly developing as a sound commercial enterprise. It is predicted that the use of from 2 to 15%

Antara Products
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Detergents
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Wetting Agents
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444 MADISON AVENUE NEW YORK 22, N. Y. OCTOBER, 1949

ANTARA PRODUCTS RELEASES NEW DATA ON STABLE, ECONOMICAL, NON-IONIC EMULSIFIERS

PRODUCT	FAMILY	FORM	STABILITY	SOLUBILITY	USES
Antarox A-200	Poly-Glycol Ether	Liquid	Extremely stable in acids, alkalis, electrolytes	Miscible with water, lower alcohols, acetone, benzene, etc. Soluble in vegetable oils. Dispersible in kerosene	Emulsifier for oils, waxes, aromatic solvents, insecticides, metal cleaning compounds. Excellent detergent
Antarox A-201	Poly-Glycol Ether	Liquid	Stable in: acids, alkalis, hard water, metal ions, boiling water, on storage	Soluble in: water, hard water, carbon tetrachloride, ethanol, vegetable oil, acetone, ethylene glycol, mineral spirits, toluene	Emulsifier for oils, waxes, aromatic solvents, insecticides, metal cleaning compounds. Excellent detergent
Antarox A-400	Poly-Glycol Ether	Liquid (Essentially odorless)	Acids, alkalis, hard water, boiling water, on storage	Soluble in: water, hard water, carbon tetrachloride, ethanol, vegetable oil, acetone, ethylene glycol, mineral spirits, toluene	Emulsifying, spreading, cleaning agent. In metal cleaning, polishing compounds, emulsifiable insect sprays. Solubilizer for perfumes
Antarox A-480	Poly-Glycol Ether	Liquid (Essentially odorless)	Stable in: acids, alkalis, hard water, metal ions, boiling water, on storage	Soluble in: water, hard water, ethanol, acetone, ethylene glycol. Moderately soluble in: carbon tetrachloride, vegetable oil, mineral spirits, toluene. Insoluble in: mineral oil	Many applications. Excellent wetting and detergent properties. Used as alkaline degreaser or as assistant in alkaline metal cleaners. Emulsifier for creams
Antarox B-100	Poly-Glycol Ester	Liquid	Stable to: hard water, metal ions, on storage, mild alkaline solutions, mild acids	Soluble in: carbon tetrachloride, ethanol, vegetable oil, mineral oil, ether, acetone, mineral spirits, kerosene, gasoline, benzene, toluene, chlorinated hydrocarbons. Insoluble in: water, hard water, electrolyte solutions but disperses in aqueous solutions	Emulsifier for cosmetic creams, assistant in kerosene cleaning of motors, cutting oil emulsifier, and in emulsion degreasing. Dry cleaning solvent, compounding, spotting compounds
Antarox B-290	Poly-Glycol Ester-Ether	Liquid	Stable in: mild acid or alkaline solutions, to hard water, metal ions, on storage	Soluble in: water, hard water, carbon tetrachloride, ethanol, vegetable oil, ether, acetone. Insoluble in mineral oil	Emulsifier for vegetable and animal oils, fatty acids, waxes, and a wide range of organic substances. In hair groom oils, herbicide emulsifiable concentrates, waxes and polishes, cosmetic creams, emulsion type paints
Antarox D-100	Poly-Glycol Ether	White, waxy paste	Stable to: acids, alkali, hard water, metal ions, boiling water, on storage	Soluble in: water, hard water, carbon tetrachloride, ethanol, vegetable oil, acetone, benzene, toluene, chlorinated hydrocarbons. Insoluble in: mineral oil, mineral spirits, kerosene, gasoline	Emulsifier for animal and vegetable oils, fatty acids and waxes. In waxes and polishes, cosmetic creams and lotions. Assistant in alkaline metal cleaning, emulsion type paints

Seven Non-ionics Used in a Wide Range of Applications as Emulsifiers

Emulsions with aromatic solvents, emulsions with chlorinated hydrocarbons, emulsions with vegetable oils and pine oils are only a few of the uses to which these versatile, economical Antara Products emulsifiers can be put.

Finding their way into a wide range of industries, these non-ionic polyglycol ethers and esters already are being used in some of the best known products on the market today. Some are used to make water-free pastes for metal cleaning. Others are used for polishing wax emulsions and pastes. Still others play an important part in the manufacture of emulsifiable insecticide and herbicide sprays and concentrates.

Several of these Antara Products are valuable materials for the cosmetics industry where they are used as emulsifiers for creams, hair grooms, deodorants, etc. Still others are combined with quaternary ammonium compounds because of their non-ionic characteristics and used to make cleaner-sanitizer products.

New Products Added

New products are being added constantly to the Antarox "A" series of emulsifiers. Most noteworthy of these are those showing high temperature stability in strong acids and alkalis.

For more information on the proper Antara Product to fit into your product or process, write—outlining your problem—to Antara Products, 444 Madison Avenue, New York 22.

FROM RESEARCH TO REALITY
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resin solids with wood waste will ultimately provide a market for 3,000,000 pounds of adhesives per year, principally urea and phenolic resins.

The co-condensation products of vinyl and allyl siloxanes with aryl and alkyl siloxanes exhibit lower curing temperatures than conventional silicone type resins and show good thermal resistance and electrical properties.

Allyl starch in solvent solutions dries very quickly and when cured forms a hard, mar-resistant surface extremely resistant to heat, solvents, acid and water. It adheres well to a variety of surfaces and is finding use as an overcoating varnish and for bonding oily or greasy surfaces.

Phenolic-elastomer adhesives, combining the strength and adhesive properties of phenolic resins with the flexibility and resilience of rubber, are finding wider application in bonding metals. A new development is the replacement of the rubber with vinyl type elastomers.

VEGETABLE ADHESIVES

Of interest to large users of liquid adhesives for bag making, box wrapping, etc., is availability of improved types of dehydrated, cold water-mixing starch-base adhesives. Improvements are in the direction of faster and easier mixing without lumping or dusting, and make even more attractive the economy of buying a dry glue.

Pasting wet hides to glass or metal plates to obtain a smooth leather surface, and drying without shrinkage is being economically accomplished by use of a water soluble starch ester derivative, and also by use of carboxymethyl cellulose ether. The adhesive must permit easy stripping of hides from the plate without tearing the fibers, and must be capable of easy washing from the hides.

WATER SOLUBLE SYNTHETIC POLYMERS

Important materials for adhesive formulation are the water soluble salts of polyacrylic acid resins and styrene-maleic acid copolymers. The acidic groups in these resins permit insolubilization by addition of polyvalent metal ions or by heating the polymer ammonium salts. Recently announced is another water soluble polymer, presumably a formaldehyde condensation type containing acidic groups, which is insolubilized by polyvalent metallic ions and by heat. A recent development of importance in this field was the expansion of polyvinyl alcohol production facilities by an improved process.

The number and size of the different fields of adhesives in use preclude a discussion of all new developments, but it is clear that emphasis has been on new applications and techniques made possible by the wide variety of adhesive properties available in today's materials.

PULP AND PAPER CHEMICALS

by C. G. LANDES,
Paper Chemicals Laboratory,
American Cyanamid Co.

DURING 1949 the shortages of many chemicals used in the pulp and paper industry have almost entirely disappeared. Chemical companies are aggressively marketing both standard and new materials and paper manufacturers are actively evaluating chemical products that show promise of improving quality, reducing costs or developing new grades of paper. Trends of chemical usage are often obscure in the case of new developments but usually become more apparent in a year or two.

PULPING AND BLEACHING

Interest continues high in semichemical pulping and peroxide bleaching, although no new chemicals are involved in either case. Peroxides, together with auxiliary agents such as sodium silicate, are being used successfully to bleach groundwood pulp and groundwood-sulphite mixtures, as well as for deinking of waste papers. Because of a shortage of sodium peroxide, hydrogen peroxide has also been employed. Special methods of applying peroxide bleaches are being studied, such as treatment of pulp in lap form with the bleaching action proceeding during storage. Chlorine dioxide is being used in one stage of kraft pulp bleaching with excellent results as to final color.

The effect of chemicals—in reverse—is shown by difficulties encountered in the use of rags containing synthetic fibers, resin finishes and special dyes. This has led to increased usage of bleached cotton linters in certain high quality bond, ledger, blotting and saturating papers.

SIZING

Although there have been no radical developments in the rosin, asphalt and wax sizes normally used, improvements have been made in quality and methods of handling. Savings have resulted at some mills as a result of the recent introduction of rosin sizes shipped at 80% instead of the usual 70% solids and the design of automatic emulsifying systems for liquid rosin size. Progress has been made on the improvement of both liquid and dry rosin sizes with respect to color properties and reduced foaming tendency. Sodium phosphoaluminate has shown good results in controlling the acidity of sized papers and improving the retention of fillers.

For surface sizing both carboxymethylcellulose and zein have given outstanding results in improving paperboard with regard to such qualities as strength, printability, grease resistance and scuff resistance. The use of a wax emulsion in the formulation of the calendar sizing solutions has contributed to better operation in many instances.

SYNTHETIC RESINS

Interest in wet strength resins continues to be quite active, and many applications are being found for the melamine and urea resins now available. Considerable fundamental work has been conducted in this field and the general principles are gradually coming to light with resultant improvements in resin manufacture and application.

Spurred on by the availability of new synthetic resins, strenuous efforts are being made to incorporate resins by stock addition methods but the complexities of operation and difficulties in developing markets for the treated papers have retarded these developments. Some of the resins being considered for "beater" addition include the phenolics, polystyrene, styrene-maleic polymers, acrylic resins and copolymers, vinyl resins and various synthetic rubbers and latices.

SPECIALTIES

The complexity of pulp and paper mill operations leads to the need for many special chemical products the aggregate volume of which is quite large. Quite naturally some of these products meet with varied success dependent upon differences in local conditions.

Several new defoamers have been marketed with good results claimed. An unmodified starch gelatinized with a high stearin content soap is stated to show good retention when precipitated with alum. A special locust bean product has given excellent improvement in bursting strength at several mills. A new method of pitch control involves the use of an emulsified petroleum solvent in the sulphite cooking process. A corn derivative having humectant properties intermediate between glycerine and invert sugar has been used as a plasticizer.

Another approach to softening paper such as toweling and tissues has been the use of a cationic mineral oil dispersion by beater addition. Numerous surface active agents are being used to improve the rewettability of toweling and similar

CHEMOIL NEWS

Chemical Division **General Mills, Inc.**

THERE IS A NEW SOURCE FOR 90% PURE PALMITIC ACID

General Mills Aliphat 6

With General Mills' new chemical plant in commercial production there is no longer a limited source for 90% Pure Palmitic Acid.

The Chemical Division of General Mills, Inc., has been in commercial production of 90% Pure Palmitic Acid for several months. General Mills ALIPHAT 6 is made by the fractional distillation process and is a technically pure palmitic acid of high quality and uniformity prepared to meet the requirements of the industrial trade.

TYPICAL SPECIFICATIONS & COMPOSITION:

Acid Value	214.0-220.0
Iodine Value (Wijs)	3.0 Max.
Titer °C.	57.0-61.0
Unsaponifiable Matter	1.5% Max.
Color (Gardner 1933)	2.0 Max.
Moisture and Volatile	0.5% Max.
Composition:	
Palmitic Acid	90.0%
Stearic Acid	6.0%
Oleic Acid	4.0%

The chemical specialties industry will find ALIPHAT 6 of special interest in the preparation of aluminum, zinc and calcium palmitates as thickening, suspension and flattening agents of unusual quality for paints and finishes.

ALIPHAT 6 is an excellent raw material for organic synthesis of derivatives, and can be used in metallic salts, soaps, cosmetics, hard greases, lubricants, emulsifying agents and leather finishing.

Other Aliphat products in the saturated fatty acid line include a 90% pure stearic acid (ALIPHAT 7), a 75% stearic acid (ALIPHAT 7-A), and a palmitic-stearic eutectic mixture (ALIPHAT 6-A). Any special stearic-palmitic combinations desired are available on request.

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Chemical Division

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grades, and several cationics can be added to the slush stock for this purpose.

Much interest in slime control is evident as the economic advantages become more apparent. Some of the many materials being employed currently include chlorine and allied compounds, the chlorinated phenols, the phenyl and pyridyl mercurials, dihydroxydichlorodiphenylmethane, naphthalene sulfonic acid condensation products, ethyl mercuric phosphate and the salts of mercaptobenzothiazole. Dehydroacetic acid has been suggested for use in antimycotic wraps for bread.

COATING

In the coating of printing papers many of the new developments reflect the current interest in machine coating. Since viscosity control is of prime importance in making the required high-solids coating colors, clay and starch manufacturers have done considerable work in supplying low viscosity clays, specially converted corn dextrine and other modified starches. To improve handling, slurry clays at 70% solids and spray dried predispersed coating clays have been marketed.

In the high strength pigment field a rutile titanium calcium pigment has shown interesting results. An anhydrous kaolin pigment has been introduced for dull coated papers and perhaps other grades. A process for converting starch with enzyme in the presence of clay has been adopted by several machine coating mills.

With most coating adhesives now readily available, and prices on a more normal basis, the battle of adhesives is now on again in earnest. Starch has shown the biggest gain proportionately over the last ten years, but consumption of some of the other adhesives is also increasing. Soya protein products are used more widely as a result of quality improvements and fairly steady prices. Casein consumption fluctuates according to price variations, but large quantities are employed particularly for grades requiring water resistance.

Athough there has been great interest in synthetic resin pigment binders, the recently introduced butadiene-styrene latex is the only one with wide commercial acceptance. This material gives a very flexible coating having good appearance and printing properties. A great deal of work has been conducted on the use of urea and melamine resins to impart water or wet rub resistance to starch-pigment coatings, but success has been limited to a few mills because of difficulty in curing the resins without meeting other complications. A new and very interesting coating process has been described recently but has not yet been developed commercially. The pigment adhesive employed is hydroxyethylcellulose dispersed in caustic soda. On contact between the wet coating and a salt solution such as ammonium sulfate, the coating is set by an ion exchange process.

Several interesting developments have been announced in the field of starch modification for coating, tub or calendar sizing and paper adhesive uses. A process for modifying certain starches by cooking with a urea resin under neutral conditions and acidifying at a temperature above the gelatinization point is claimed to give a water resistant adhesive with good working properties. The nitrogen chemical, dicyandiamide, has shown beneficial results in viscosity reduction and stabilization of converted starches. Acetone-formaldehyde resins have been introduced to insolubilize starch on the alkaline side for corrugating adhesives.

PROTECTIVE COATINGS

by HARRY BURRELL,
Finishes Division, Interchemical Corp.

A LISTING of some of the hazards from which protection is offered by coatings developed within the past year highlights the complexity of modern civilization. Paints are now available which are resistant to: atomic radiation and prespiration; highway traffic, insects and barnacles; mildew, mold, rot and fire; the sticking of bread to baking pans and of ice to airplane wings; heat from smoke stacks, jet planes and electric light bulbs; corrosion from sea water and electroplaters' baths. Even prosaic house paint reflects rising labor costs by the marketing of one-coat products which really cover and endure.

Production of protective coatings has always been an important facet of the chemical industry; the current state of coatings science has made the relationship more complex than ever. Advances in fields of chemistry quite remote from paint and varnish often exert a profound directional influence on its progress. For example, the war-time developed synthetic rubber industry is indirectly responsible for one of the current major trends. The tremendous quantities of mass-produced rubber required such enormous amounts of styrene and butadiene that the prices for these raw materials declined to figures where they sell for less than the traditional drying oils. This is chemically exciting because the technical utility of all three of these materials depends on their common molecular unsaturation. As a result, practical economics has led to the production of styrenated oils and alkyds as new vehicles. The drying speed of such products is rapid, and the films obtained are hard, tough, light in color and of excellent glossy appearance. Adhesion is generally good, and resistance to water, acids and alkalis is outstanding. Styrene is not the only modifier, currently used, for similar products containing cyclopentadiene, acrylates and vinyl compounds are now offered.

"Inverted synthetic rubber" has also attracted much attention. This product is a hard water-white, resinous film former prepared from 75 per cent styrene and 25 per cent butadiene or isoprene. It will be recalled that the inverse proportions are used to prepare synthetic rubber. A related styrene-containing complex polymer has been blazoned as "an organic porcelain" because it lends itself to the formulation of excellent non-yellowing, white enamels having exceptional resistance to grease, acids, alkalis and other chemicals, as well as superb gloss retention and mar-proofness. Styrene has also been used in considerable quantities when copolymerized with maleic anhydride to form a complex resinous acid, soluble in aqueous alkalis.

"PETRO-PAINTS"

The petroleum industry is also intimately tied in with current paint developments. Of course the use of petroleum thinners and solvents has been common for years, and the relationship to synthetic rubber, already discussed, in supplying raw materials for butadiene and styrene has been very important. A more intimate connection has been developing in recent years, however, and this is typified by the opening of the first commercial synthetic glycerol plant just a year ago by an oil company. Likewise, the production of phthalic anhydride from *o*-xylene of petroleum origin has avoided further depletion of supplies of naphthalene. Maleic anhydrides, formaldehyde, pentaerythritol and other raw materials used by the paint industry have all been manufactured recently from petroleum-derived sources.

A development of far-reaching potentialities has been the offering of synthetic higher alcohols, such as isooctyl and nonyl, which are manufactured by the Oxo process. Esters of these materials can now be wholly derived from petroleum, a circumstance which may ultimately materially reduce the cost of all-important plasticizers. The paint and varnish industry is watching with considerable interest the related development of the Fischer-Tropsch process for gasoline manufacture, since by-products from commercial plants may make the now more expensive oxygenated solvents as cheap as petroleum thinners.

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This southeastern source for acetic acid will give Celanese customers the benefits of bulk prices and the efficiency of less-than-tank-car shipments.

GLACIAL ACETIC ACID U. S. P.

Acetic Acid Content	99.5% by weight, minimum purity
Water Content	0.5% by weight, maximum
Freezing Point	15.6°C, minimum
Specific Gravity	1.050 to 1.055 @ 20/20° C.
Color	Water White
Formic Acid Content	0.05% by weight, maximum
Non-Volatile Matter	0.001% by weight, maximum
Iron Content	1.0 PPM by weight, maximum
Permanganate Time	2 hrs. min.

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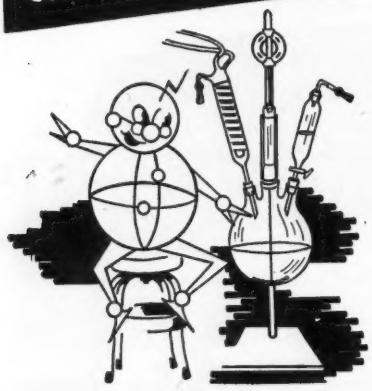

METALLOY SCORES ANOTHER FIRST!

Metalloy now offers the most convenient form of Lithium metal thus far developed for organic synthesis —LITHIUM METAL SHOT.

Some research workers find Metalloy Lithium Metal Wire well-suited to their needs. Others prefer finely-divided Metalloy Lithium Metal Sand. Nevertheless, there is a serious need for Lithium Metal in a form having the best qualities of both, particularly for commercial scale reactions.

Metalloy's answer to this need is the new and *revolutionary*—LITHIUM METAL SHOT. In appearance it resembles the shot form of lead and zinc. Its advantages are apparent to all engaged in organic synthesis. It provides sufficient surface for optimum reaction rate. And because it requires a minimum of protective oil, accurate weighing is assured.

In response to users' requests, Metalloy offers Lithium Metal in the following forms:

1. *Lump*
2. *Wire, 1/8" dia.*
3. *Shot*
4. *Sand, 60 mesh*
5. *Rod*

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What promises to be an important development in new resins for coatings, the resinous polyalcohol Epons, is also dependent on oil compainies for two of its raw materials, acetone and epichlorhydrin. The Epons are reported to produce floor paints with phenomenal abrasion and wear resistance, and unsurpassed water and alkali resistance.

PIGMENTS

The paint business is one where inorganic chemistry vies with organic, particularly in the production and use of pigments. Recently new shades of iron oxide have been made possible by controlling the particle size and shape. By modifying bentonite clay, it has been possible to develop new flatting and thickening agents. A cheap black pigment has been made from shale residues, while "white dyes" have been proposed which are colorless compounds which fluoresce blue in sunlight.

Since the first of this year, paint sales have been off appreciably from a year ago. The slump is, of course, a part of the general situation which has now been widely recognized. The industry is hopeful of reasonably prompt improvement and is preparing to meet the challenge with improved products and cheaper prices to the extent possible with future raw material and labor costs.

DISINFECTANTS

by G. R. GOETCHIUS, Bacteriologist, Rohm & Haas Co.

FOLLOWING the pattern established during the past few years, research and development in the field of disinfectants have continued to center around the quaternary ammonium compounds. Because of their unique properties of freedom from odor, lack of corrosiveness, low toxicity, and adaptability to formulation with various cleaning, detergent, and sequestering agents, the quaternary ammonium germicides have continued to increase in popularity. As a matter of fact, the total consumption of quaternaries in 1948 was about 1,000,000 lbs. on the 100% active ingredient basis, and sales for 1949 show that an increase may be expected.

Investigation of test procedures for the evaluation of the germicidal effectiveness of quaternaries has received a good share of the research in this field. It has become obvious that no one test procedure is entirely satisfactory as a measure of all-round effectiveness, but specific procedures designed to simulate field conditions have been proposed for individual application of these compounds. In conjunction with these investigations, considerable work has been done in the search for a good neutralizer of quaternary ammonium compounds. Neutralizers are essential for stopping germicidal action in laboratory experiments as well as being a necessary component of swab-rinse vials such as are used by public health inspectors in the examination of eating and drinking utensils. Among the compounds exhibiting the best quaternary-neutralizing properties are sodium naphuride and Tamol N.

DETERGENT-SANITIZERS

The most important development during the past year has been in the field of "detergent-sanitizers." These may be in either powder or liquid form, and usually combine a quaternary with a compatible non-ionic synthetic detergent. The powdered products may contain in addition various alkaline cleaning agents, such as soda ash, trisodium phosphate, or sodium metasilicate together with organic or inorganic sequestering agents. Following the demonstration that hard waters have an adverse effect upon the germicidal action of quaternaries, it has been found that these detergent-sanitizer formulations are more effective in hard water than the quaternary alone in distilled water.

Detergent-sanitizers are a remarkable step forward, especially on the dairy farm where excellent results have been obtained in supplying milk with low thermoduric counts to dairies. Up until the past year, it was considered necessary to thoroughly clean a surface *before* treatment with a germicide. The better detergent-sanitizers now appear to perform both operations with a considerable degree of efficiency.

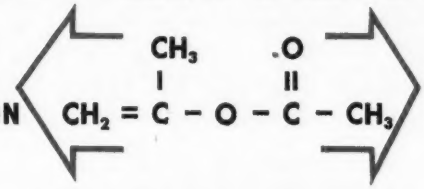
With the increased usage of quaternary germicides, another problem has appeared in the determination of proper strength sanitizing solutions in the field. The N. A. I. D. M. (National Association of Insecticide and Disinfectant Manufacturers) has investigated this problem very thoroughly, and its technical committee has compared all the known methods presented to date with the result that the "Testab" method is recommended as the best available procedure.

CHANGING ATTITUDE

Government and public health officials have been somewhat reluctant to wholeheartedly endorse the quaternary ammonium germicides. Most of these in-

ISOPROPENYL ACETATE

ESTER EXCHANGE — COPOLYMERIZATION



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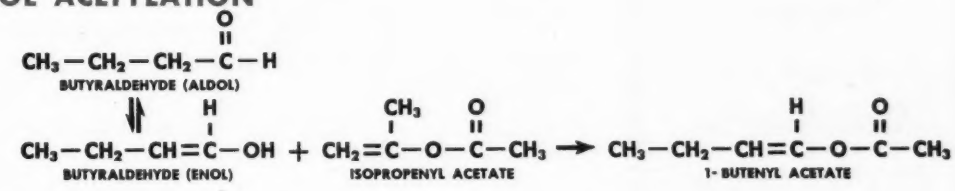
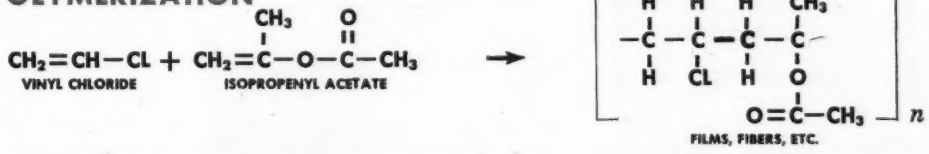
TYPICAL REACTIONS

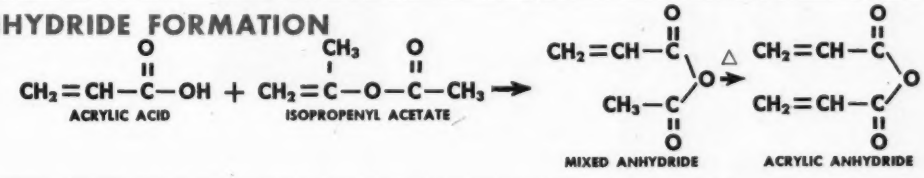
ENOL ACETYLATION



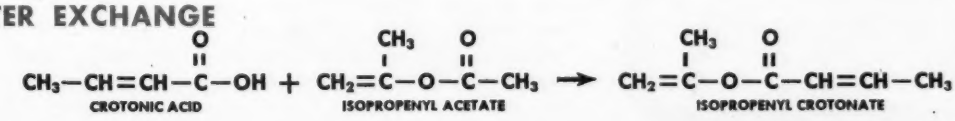
COPOLYMERIZATION



ANHYDRIDE FORMATION



ESTER EXCHANGE



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Butyl Ester

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dividuals feel that the quaternaries have a very definite place in the field of disinfection but have assumed a conservative attitude regarding their use. However, such steps as the Bureau of Animal Industry's approval for the use of quaternaries in meat-packing plants, and the substitution of "chemical agent" for "chlorine" in the Milk Code indicate a definite trend in public official attitude.

In sharp contrast to the quaternary ammonium compounds, there have been practically no new developments among the phenolic, cresylic, pine oil, and chlorine type disinfectants. This is probably due to the fact that they have enjoyed a long-time acceptance and continue to be popular in usages where odor, color, toxicity and corrosiveness are not important factors. The one notable exception has been the incorporation of bis-(3, 5, 6-trichloro-2-hydroxyphenyl) methane in toilet soap. This particular compound, commonly known as G-11, had previously been used to some extent in surgical scrub soaps, but it was only during the past year that it was placed on the market in the form of toilet soap. It is too early at this writing to determine whether or not it will be successful in the household field.

POLISHES

by A. E. MOORE, Director,
New Products Development Division,
R. M. Hollingshead Corp.

SURVEYS made during 1949 on polishes, cleaners, and waxes manufactured for use on automobiles and other surfaces, such as linoleum, glass, plastic, tile, and furniture, indicate this field is becoming more and more competitive each year. Increased competition generally leads to better products for the consumer and in many cases, lower prices.

Scores of new brands have made their appearances on the market, but most of them are the usual run of products, under new wraps. Catchy names for the products, as well as coined names for common, ordinary ingredients used in their formulation are being widely exploited by many manufacturers in an effort to snare a portion of the market by clever advertising.

The automobile market for polishes, cleaners, and waxes is extensive and profitable. There are more than 33,000,000 cars in use today, and of this total about 42% are ten or more years old. The trend in automobile polishing today is away from the ordinary polish. This type is on the way out, and is being replaced by combination cleaner and wax; and by the use of two separate products, cleaner and wax, because these products give better protection and longer lasting results.

SPRAY WAX

A new and interesting approach to automobile and furniture waxing came on the market in 1949—spray wax. Special formulations of hard waxes, such as carnauba and some of the new synthetic waxes are being offered for spray application through the use of power sprayers, aerosol cans with Freon or Genetron as propellents, or sprayers which can be pumped by hand.

A cleaned automobile can be wax sprayed with a power sprayer in less than two minutes, in five to ten minutes by using an aerosol low-pressure can. This ease of application has great appeal to both the car owner and the professional waxer, and the use of spray wax is expected to greatly increase in the coming year.

Many automobile paste waxes are still hard to use. With a lot of them a continuous film is difficult to obtain, and this results in a streaky surface after a few weeks exposure. With the introduction of spray wax, the use of paste type wax may decline, because it is natural for all of us to seek out and find easier ways of getting things done.

FLOOR POLISHES

Floor polishes now used for such coverings as linoleum, rubber, and asphalt tile, are practically all of the water-base, no buffing, wax type. Snythetic resins and oxidized microcrystalline waxes have almost entirely replaced shellac and carnauba wax in some of the cheaper brands, and are used extensively in some of the well-known brands. We have noticed the stability, or shelf life of the water-base waxes, has improved during the past two years, which denotes manufacturers are developing better formulations, and are more closely controlling mixing processes.

As with all products there is still room for improvement, especially in wax products. Floor waxes of the self-polishing type could be improved to better "lay down," gloss characteristics, scuff resistance, flexibility, and tackiness during humid weather.

Synthetic waxes, new waxes of petroleum origin, and montan wax derivatives are being used more extensively in wax base products. Some times they are used to reduce costs, but in many cases, research has proven these waxes are superior to natural waxes for specific uses.

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The new Atlas HLB system gives the industrial chemist a "rifle" method of choosing the right emulsifier for a particular job. No longer does he have to depend on blind-firing hit-or-miss "blunderbus" methods! Often, you can save hours—even weeks—of tedious experiments.

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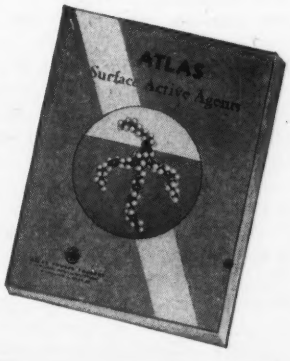

The Atlas HLB system of choosing emulsifiers is the first of its kind! You'll find it described in detail in the Atlas Surface Active Agents book. Send for your copy today—seventy formulas make it a handy reference guide in producing various emulsions.

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CHEMICAL SPECIALTIES—

HOUSEHOLD INSECTICIDES

by G. ALLEN MAIL
Entomologist, Boyle-Midway, Inc.

IT would appear that there is a continued and growing interest in low-pressure aerosol insecticide dispensers. At the summer convention of the National Association of Insecticide and Disinfectant Manufacturers in Chicago last June, discussions on aerosol dispensers of insecticides aroused great interest. So evident is it that this type of household insecticide dispenser is here to stay, that the N.A.I.D.M. Insecticide Scientific Committee has promulgated rules governing the use of a Tentative OTA or Official Test Aerosol. Should this TOTA be accepted as a standard of performance as is the OTI (Official Test Insecticide) for space sprays, then a grading system for aerosols will follow.

Approximately a score of low-pressure insecticidal aerosols are now on the market, many of which duplicate each other as to formulae and only one or two of which exhibit radical departures from the norm. The DDT content varies from 1 to 3 per cent and one contains also some methoxychlor; practically all contain pyrethrins and, with only one exception, all contain a synergist, either piperonyl butoxide or sesamin and sesamin extractives. In most cases the ratio of non-volatiles (active ingredients) to propellent is 15 to 85, although two of the best dispensers have a 20-80 ratio. The propellent in most cases is a mixture of Freon 12 (dichlorodifluoro methane) and Freon 11 (trichloromonofluoro methane) but in some cases methylene chloride takes the place of Freon 11. A new propellent that functions very satisfactorily is Genetron, a product of the General Chemical Division of Allied.

Low-pressure insecticidal aerosol prices continue to show a large spread. Paradoxical though it may appear, the appearance of low priced and cut rate dispensers may hurt the future development of a stable market by making it impossible for manufacturers to net sufficient profit to permit promotional or advertising campaigns. Present retail prices for a 12 ounce low-pressure dispenser range from 85 cents to $1.85. One specialized aerosol for use against moths is priced at $1.98.

LETHANE IN AEROSOLS

Lethane 384 regular, the thiocyanate manufactured by Rohm & Haas Co., which has proved to be such an excellent knowndown agent and insecticide, is now for the first time being permitted as an ingredient in aerosol insecticide dispensers. While the pungency and irritation of the aerosol fog containing high percentage of Lethane may probably preclude its use as the sole toxicant, there is no doubt that its inclusion in aerosols in moderate amounts definitely will improve insecticidal performance.

Chlordane continues to be a very valuable household and garden insecticide. Where two years ago, there were only two or three emulsifiers suitable for the formulation of chlordane sprays, a recent publication by Julius Hyman & Co., one of the two manufacturers of chlordane, lists 28 emulsifiers for making emulsifiable concentrates and emulsions of chlordane.

Chlordane in a 40% concentrate is now being sold under the name of Engo by the Fort Dodge Laboratories for the control of ticks, lice, fleas and sarcoptic mange mites of animals.

The publicity about DDT-resistant flies has caused some manufacturers of insecticides to consider combinations of DDT and chlordane. There are now three or four insecticides on the market containing this combination.

In connection with DDT-resistant flies, benzene hexachloride also has been investigated and found to give excellent results. The pungent odor of crude benzene hexachloride has hitherto ruled it out of consideration as a household insecticide. However there are now available insecticides containing the pure gamma isomer of BHC which is relatively odorless. The USDA Bureau of Entomology and Plant Quarantine has selected the word Lindane as the common name for the gamma isomer of BHC of a purity of not less than 99 per cent. Household insecticides with Lindane as the toxicant may therefore be anticipated in the not too distant future. At least two large companies are now offering wettable powders containing this material.

MOTHPROOFERS

Use of methoxychlor, either alone or in combination with DDT, was a new development in mothproofing treatments during the last year. Silicofluorides, arsenicals, chlorinated hydrocarbons and so-called permanent mothproofing materials of the colorless dyestuff type, still are being widely distributed. One firm is pushing two quarternary ammonium compounds, one water soluble and one oil soluble, as mothproofing agents. These products perform quite well but after washing or drycleaning, retreatment of the garments will be necessary. Paradichlorobenzene as crystals, nuggets and blocks under many different brand names still appears

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to be highly popular with the public as a moth repellent.

One of the most interesting developments and one which may have far reaching effects on the household insecticide industry is the synthesis of pyrethrin-like esters by U. S. Department of Agriculture workers. These are as insecticidal to houseflies and other insects and as nontoxic to higher animals as the natural ester.

A series of misleading articles on the dangers of DDT as an insecticide appeared this spring in a New York newspaper. These irresponsible and erroneous statements aroused confusion and apprehension in the minds of the readers. However, the quick defense of DDT by top government scientists successfully allayed public fears before too much harm was done. Household insecticides containing DDT, properly labelled with adequate directions for use and effective cautionary statements, continue to enjoy a good sale.

HOUSEHOLD CLEANERS

by FRANCIS E. JILK
The J. R. Watkins Co.

PROGRESS in household cleaners over the past year has been a continuation of the trend from soap to synthetic detergents for a variety of applications. They have found increasingly wider acceptance in dishwashing compounds because they do not form a precipitate in hard water, they have greater solubility for grease and they leave dishes and glassware bright and shiny without rinsing. Most of the new products appearing on the market have their detergent properties enhanced by the incorporation of alkali builders. There are three forms of these materials: powdered mixtures composed of detergent and alkali; pellets of spray-dried detergent formulated with builders; and liquids, with or without alkali. Dispensers have been developed for all of these types to make it easier for the housewife to use them.

In laundry preparations, consumers have turned from soap to synthetics to a large extent, particularly in hard water areas. Here, both alkaline and neutral builders are being used in combination with sodium carboxymethylcellulose which prevents redeposition of soil once it has been removed. These newer products approach, and in some cases exceed, the detergency of soap on cottons, thus removing one of the prime drawbacks of synthetic detergents for such uses. Another significant advance made possible by synthetic detergents has been the development of materials which, combining good detergency with non-foaming characteristics, work very well in automatic laundry machines.

LIQUID CLEANERS

All-purpose liquid cleaners composed of soap, ammonia, and solvents, have been on the market for some years. These cleaners are intended for use in the household for such purposes as rug shampooing, wall cleaning, cleaning upholstery, etc. New products of these types also have been based on synthetic detergents. These new products not only are superior cleaners but they have the advantage of being less harmful than old formulations to material on which they are used.

A fairly recent development has been the introduction of liquid detergent-sanitizers for household use. These cleaners, composed of a non-ionic synthetic detergent and a quaternary ammonium compound, have the advantage of both cleaning a surface and reducing its bacterial count in one operation. While there is a definite increase in their popularity for industrial sanitizing, how well the housewife will take to them is not yet known.

Powdered cleaners for washing painted walls, etc., have also felt the impact of synthetics, and the newer formulations include a small amount of synthetic detergent to improve cleaning properties.

SCOURING POWDERS

Scouring powders, long neglected by manufacturers who have put most emphasis on packaging and advertising soap and synthetic detergents, have been made more attracive to the consumer. In addition to having cleansing properties improved by the incorporation of a small quantity of synthetic detergent, they have appeared in improved packages available in various colors to blend with typical bathroom and kitchen color schemes. Moreover, a few products are being perfumed. These merchandising aids, coupled with combination sales of a can of scouring powder with a box or bottle of detergent, have sparked interest in this old kitchen standby.

GLASS CLEANERS

The trend to the "Glass Wax" type of glass cleaners has continued so that the market is virtually swamped with new brands of this kind of window cleaner. Solvent and water types are still being sold, but in lesser volume. Primary reason for this has been the versatility of "Glass Wax" types, which, because they contain mild abrasives, are ideal for tile, porcelain, silver, chromium, etc.

NEWS IN THE AMINO ACID FIELD

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B. F. Goodrich Chemical Company
that may have possibilities
for you

β-Alanine

$NH_2CH_2CH_2COOH$

This chemical, now being used by the pharmaceutical industry for the synthesis of pantothenic acid, is suggested for consideration in other fields where a low molecular weight, water-soluble amino acid may be useful. β-alanine is available in commercial quantities.

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$C_{12}H_{25}NHCH_2CH_2COOH$

This long chain aliphatic amino acid has unusual properties of emulsification and foam stabilization. Available in experimental quantities.

N-(Hydroxyethyl)-β-alanine

$HOCH_2CH_2NHCH_2CH_2COOH$

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For further information on any or all of these new amino acids, please write Dept. CC-10, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

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RUBBER CHEMICALS

by S. S. ROGERS
R. T. Vanderbilt Co., Inc.

TOTAL consumption of chemicals by the rubber products industry over the past year has been below the level of the previous year by an estimated 10 to 15 per cent. The low point occurred during the months of April through August over which period export sales were very low. Production of tires, tubes, and automotive rubber products held up well and prevented the overall decline from being much more severe. It is expected that sales to the producers of wire and cable and general mechanical goods will improve consideraby this coming fall.

Prices for the year have remained quite stable on most materials since they were advanced little or none during the war years.

Competition among rubber product manufacturers has reached a high pitch and the drive to meet it has affected the chemicals market in two important ways:

(1) In an effort to reduce material costs, a relatively greater demand has been created for the inexpensive volume loading materials such as clays, whitings and fine thermal blacks.

(2) Efforts to lower production costs in the factory have stimulated the manufacturers' interest in new chemicals and new ideas for the application of standard chemicals. Although cost and quality considerations are important, particular emphasis is being placed on the need for those which offer processing advantages.

The consumption of "cold rubber," the new process GR-S polymer introduced in 1948, is increasing rapidly. It is going principally into the manufacture of tires where improved tread wear is claimed to be phenomenal. It is expected to move rapidly into other fields.

A new trend in the field of automotive mechanicals is a growing demand for the use of butyl rubber in parts exposed to light. Butyl is a superior rubber in this respect, and it is likely that improvements will be made in both the polymer and its compounding in order to meet the demands of the automotive industries.

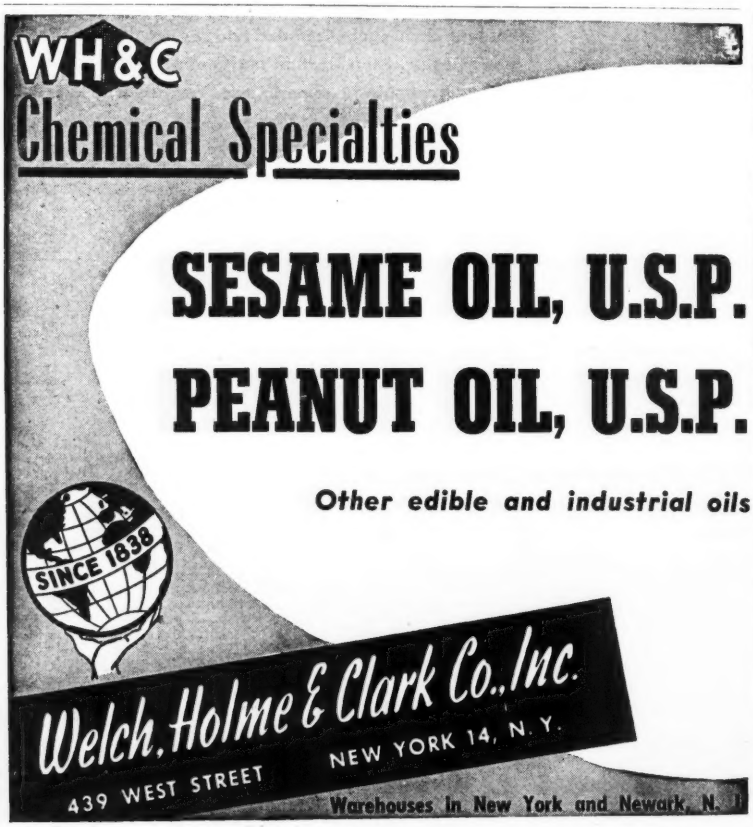
FURNACE BLACKS GAIN

Fine furnace blacks also have been finding wider acceptance and are being consumed in greater quantities. Increased production of this type of black has developed in the past year at the expense of channel types.

Research in the field of antioxidants has produced nothing of great importance but in accelerators there have been two noteworthy developments:

(1) New accelerators for use with the fine furnace blacks and all scorchy stocks have been developed and are being evaluated by the rubber goods manufacturers. These accelerators, in laboratory evaluations, have been found to possess satisfactory curing properties and exceptionally safe processing characteristics.

(2) Many accelerators previously supplied in the form of fine powders are now available in dustless form. This is an important step in improving the working conditions in the factory compound and mill rooms. The advantages obtained are better dispersion and a greatly reduced tendency to dust in handling.



TEXTILE CHEMICALS

by H. C. BORGHETTY
Technical Manager,
Organic Chemicals Division,
General Dyestuff Corp.

THE textile industry continues its readjustment difficulties which were already evidenced last year. Prices and production have both dropped appreciably and many marginal textile dyers and finishers have curtailed considerably or have actually discontinued operations. Notwithstanding, some of the more progressive mills have introduced new lines keynoted mainly by good consumer advertising. Labeled textile garments are being actively promoted.

Textile chemical laboratories continue to devote the majority of their activity to the development of synthetic resin finishes. The use of resins in the rayon garment field is now well established and responsible for the greatest advance made by rayon fibers in recent years. The advent of crease resistant and dimensionally stable fabrics accounts for the continued and increasing production of rayon fabrics not only for sportswear but also for many types of men's summer wear suitings Woolen and worsted suiting manufacturers have felt the keen competition of rayon and are adjusting their programs to merchandise washable-woolen fabrics. The development of non-shrinkable treatments by chlorination processes and resin

NEW HEYDEN CHEMICAL "BUILDING MATERIALS"

ANISIC ACID

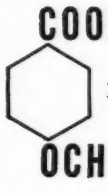
Availability:
Commercial quantities

•

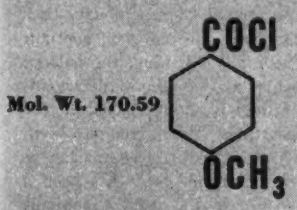
Containers:
100 lb. fiber drums

PROPERTIES

Appearance	Light tan powder
Melting Range	180°C.—183°C.
Assay	99.5%
Solubility	Insol. in water, sol. in alcohol, etc.



Mol. Wt. 152.14



Mol. Wt. 170.59

ANISOYL CHLORIDE

Availability:
Commercial quantities

•

Containers:
500 lb.
stainless steel drums

PROPERTIES

Appearance	Clear colorless liquid
Freezing Point	22°C.
Boiling Point	263°C. Sl. dec.
Sp. Gr. 25°/25°C.	1.258

ORTHO-CHLOROCINNAMIC ACID

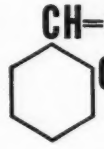
Availability:
Pilot plant quantities

•

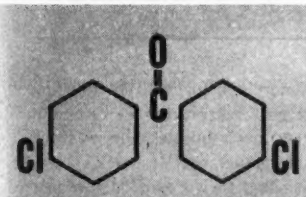
Containers:
100 lb. fiber drums

PROPERTIES

Appearance	Light tan powder
Melting Range	207°—212°C.
Assay	98.5%
Solubility	Insol. in water and alcohol, sl. sol. in ketones



Mol. Wt. 182.60



Mol. Wt. 251.11

4,4-DICHLOROBENZOPHENONE

Availability:
Pilot plant quantities

•

Containers:
100 lb. fiber drums

PROPERTIES

Appearance	Ivory powder
Congealing Point	145°C.
Assay	99.0%

Technical literature and samples sent promptly upon request on company letterhead

HEYDEN
CHEMICAL CORPORATION
393 SEVENTH AVENUE, NEW YORK 1, N.Y.
CHICAGO 6 • PHILADELPHIA 3
SAN FRANCISCO 11 • RUMFORD 16, R. I.

FINE HEYDEN CHEMICALS

Benzaldehyde • Benzoates • Benzyl Chloride • Bromides
Chlorinated Aromatics • Chlorobenzenes • Creosotes • 2,4-D
Formaldehyde • Formic Acid • Glycerophosphates • Guaiacols
Hexamethylenetetramine • Medicinal Colloids • Methylene
Disalicylic Acid • Paraformaldehyde • Parahydroxybenzoates
Penicillin • Pentaerythritols • Propyl Gallate
Quadrafos • Salicylates • Salicylic Acid • Streptomycin

formulations, indicates that standardization has not yet reached its final stage.

RESINS FOR COTTONS

By far the greatest potential market for synthetic resins lies in the adaptation of these materials to cotton. Synthetic resins, originally developed for cotton, have not found their greatest use for this fiber because of the tendering results which have been noted, and also because of the chlorine absorption which created further weakening during laundering.

Intense investigation of the field revealed that appropriately constructed cotton fabrics, which already possess outstanding strength, can be satisfactorily placed on the market and finally indicate that this field will open a vast outlet to synthetic resins.

These considerations indicate the necessity for the textile finishing industry to modify its present equipment and to install continuous long range drying and curing units. We can expect a continued and increasing activity in mill remodeling programs and consequently also, a decided change in the types of dyeing equipment required to meet the tendency of stream-lined wash-fast fabrics. Fortunately the dyestuff and chemical industries are in a good position to supply the increased demand for fast colors and for resins. Fortunately also, dyeing and finishing processing has reached the stage where new installations and remodeling can be carried out readily in the majority of textile mills without involving great loss of time, or necessitating intricate training techniques.

Of great importance to the entire textile industry, and certainly the factor which will contribute most to improve fabrics, garments and merchandising techniques, has been the fundamental change which has taken place in the control of mills. Large converters of fabrics have entered the weaving and dyeing fields, while many large dyers and finishers have entered the converting field, thus assuring control of all the operations from fiber to finished garment under one management. This in turn means greater efficiency of production, further economy in operations, and a better flow of knowledge through various branches of the industry. It naturally follows that newer mills will be constructed and that smaller units will be discontinued.

In the bleaching of fibers, peroxide, because of the new equipment introduced, is gradually superseding chlorine in some of the plants.

In the scouring of textile fibers, synthetic detergents, which have always been well acceptable in the industry, continue to grow. Generally speaking, the balance between soaps and synthetic detergents has been rather well established in the various operations. Very few new synthetics have appeared on the market in the last ten years, but there has been a greater impetus in the use of nonionic detergents in place of anionic types. There has been no outstanding development in other chemicals or in the dyestuff field during the year.

In regard to textile fibers, nylon has been introduced into fabrics and knit goods, and is meeting with success, but no other textile fiber of importance has been introduced for large scale manufacture.

HUNTING FOR GLYCERINE?

Armour has it as close as your phone. Just call the nearest of Armour's 332 convenient stock points for all grades. Quick delivery keeps your inventories low.

ARMOUR *Glycerine Division*

Armour and Co., 1355 W. 31st St., Chicago 9, Ill.

DOWN GOES the PRICE of
Parachlorobenzonitrile

White solid
M.P. 91-92°C.

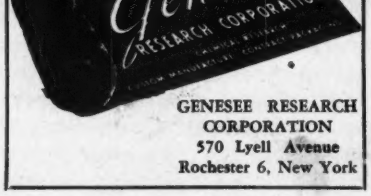
At the greatly reduced price, you can now afford to investigate the possibilities of this new organic chemical in your research program.

Another new organic from Genesee Research Laboratories

Parahydroxypropiophenone

Light yellow solid
M.P. 145-147°C.

- Send for products lists of more than 45 rare organics.
- Inquiries for the manufacture of organics you want are invited.



GENESEE RESEARCH CORPORATION
570 Lyell Avenue
Rochester 6, New York

SPECIALTIES NEWS

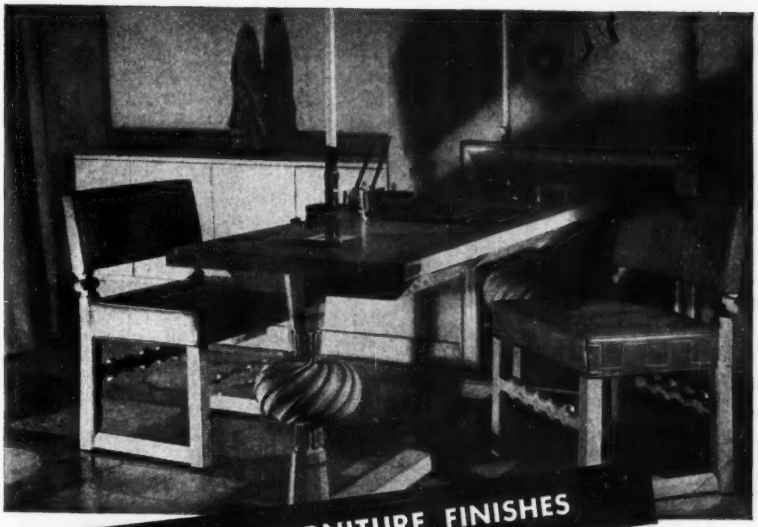
Bridgeport Brass Appeals Aerosol Patent Ruling

Bridgeport Brass Co., Bridgeport, Conn., has appealed the decision of the chief judge of the U. S. District Court, District of Conn., in which the Rotheim patents—the basis of practical application of the aerosol principle—were declared invalid. The company has taken its appeal to the U. S. Circuit Court of Appeals.

The suit involves Bridgeport Brass Co. and the Bostwick Laboratories, also of Bridgeport. The charge is that Bostwick has infringed upon Bridgeport Brass Co.'s key patents in the aerosol field. When these patents were held by the U. S. District Court to be invalid because they were in the field of prior art, Bostwick filed a counterclaim for $100,000 alleging that Bridgeport representatives caused it to lose that much business by warning jobbers and retailers of Bostwick's aerosol products that they would be sued for patent infringement.

Sees Sodium Fluosilicate As Rat Repellent

Clifford A. Hampel, Armour Research Foundation of Illinois Institute of Technology, Chicago, reports that sodium fluosilicate, properly coated on the outer surface of paperboard shipping cartons, may be an effective rat repellent. He also suggests that it might be applied in the glue lines of the paperboard, or incorporated



FROM FURNITURE FINISHES

TO WALL COATINGS

Nothing takes the place of Glycerine

Millions of pounds of glycerine flow into the manufacture of alkyd resins yearly—satisfying the huge demand which has continued since World War II.

Because synthetic resins (most of which are glycerine alkyds) have made it possible to produce lacquers that are non-chipping or cracking . . . non-brittle . . . rapid drying . . . and light colored—they have been designated "the penicillin of the furniture industry" by one executive! Furthermore, because solutions of alkyd resins can be easily emulsified and because they form insoluble, durable films, they have become an invaluable ingredient in interior wall coatings. And—extensive research has indicated that they will play an important part in the solventless coating compositions of tomorrow.

For sheer versatility, glycerine's combination of physical and chemical properties can be matched by *no* other product! That's why—for dependable performance in over 1500 industrial applications—*Nothing takes the place of glycerine!*

GLYCERINE PRODUCERS' ASSOCIATION
295 Madison Avenue, New York 17, N. Y.

Technical GLYCERINE NEWS

"CRACK-FILLING" COMPOSITIONS rely heavily on glycerine and its derivatives. Described as "highly satisfactory" is a typical formula containing rosin solution, glycerine, butyl alcohol, whiting, wood flour and dope. One of the best known crack-filling products contains ester gum which is made by reacting rosin with glycerine. (R-14)

★ ★ ★

FAST DRYING SPEED, HIGH GLOSS, GREAT DURABILITY and excellent color are qualities claimed for a new oxidizing type phthalic alkyd resin. The new resin is designed to meet the stringent requirements demanded of paint vehicles in the countless body repair shops, paint shops and garages where winter temperatures often fall below the optimum. Enamels formulated with this resin are fast drying—applicable to farm implements, gasoline pumps, metal signs and other surfaces requiring repainting. (R-15)

★ ★ ★

NOVEL COATING COMPOSITION said to be capable of forming a rawhide-like covering is described by J. A. Schroeder in Canadian Patent 452,428. The formula consists of glue (from rawhide), invert sugar, glycerine, phenol and safrole. Copies may be obtained by writing the Canadian Patent Office, Ottawa, Canada. ★ ★ ★

GLYCERINE SECTIONS OF BEILSTEIN TRANSLATED! Now available for the first time, an English translation of the Glycerine Sections of Beilstein's famous *Handbuch der Organischen Chemie* (4th Edition). Complete in *one* volume entitled "GLYCERINE AND SOME GLYCERINE DERIVATIVES."

Publication authorized by the Attorney General of the United States. Compiled and edited by Dr. R. N. DuPuis, Dr. C. S. Miner, Jr. and J. B. Segur—long acknowledged as authorities in the field of Glycerine and its properties. Amassed in its 210 pages are an unusually large number of Glycerine derivatives with extensive cross-references. Also included are a complete table of contents and a detailed index of the derivatives and fatty acid esters of Glycerine. A timely, comprehensive volume for your chemical reference library.

Order from the Glycerine Producers' Association enclosing $2.50 (check or money order) for each copy.

GLYCERINE PRODUCERS' ASSOCIATION, DEPT. 3
295 MADISON AVENUE
NEW YORK 17, N. Y.

I should like to know the source of those items appearing in Technical Glycerine News which I have checked below.

☐ R-14 ☐ R-15

NAME.....

COMPANY.....

ADDRESS.....

in the paperboard itself at the time of manufacture of the chip layer and liner sheets. Elimination of rat damage to packaged foods and other products would save industry several hundred million dollars a year.

Critical studies to evaluate these possibilities are now being carried on with the aid of James B. DeWitt, U. S. Fish and Wildlife Service, Patuxent Research Refuge, Md. Sodium fluosilicate incorporated in food in very small quantities has caused rats to refuse the food over a four-day test period. The chemical has the advantage of being an irritant and repellent to warm-blooded animals, even in small quantities, but has not been considered a dangerous poison.

Sodium fluosilicate, Hampel believes, could be used as an effective weed killer; to defoliate cotton plants in preparing them for the picking machine; to sterilize the soil in preparation for planting certain plants, chiefly tobacco; as an insecticide in the control of weevils, cutworms, and other pests.

Paint Remover Described In Government Report

A new paint remover that can be sprayed on to the painted surface, and may prove a successful highspeed method for various industrial processes, is described in a report now available from the Office of Technical Services of the U. S. Department of Commerce, Washington 25, D. C.

Aircraft camouflage enamels were so resistant to ordinary paint removal techniques that a special preparation had to be developed by the Air Force for this purpose. The original paint remover developed, however, was not stable enough in storage to give satisfactory service. It is now believed that revisions in the basic formula have met the storage problem satisfactorily, and a specification now exists which is superior to special-purpose proprietary items heretofore available, according to the report.

The basic formula is methylene chloride (commercial grade), 76.5% by weight; methyl alcohol (specification AN-M-32), 6.5%; cellosolve (ethylene glycol monethyl ether), 4%; methyl cellulose (commercial medium viscosity), 2%; wetting agent (sodium petroleum sulfonate), 5%; paraffin wax (specification VV-P-121, Type 1, Grade A), 3%; water, 3%.

PB 97658, *Development and Evaluation of Paint Remover,* 61 pages including tables and photographs, sells for $1.75.

U.S.I. Producing APF On Tonnage Scale

Tonnage production of Animal Protein Factor as a primary fermentation product has been achieved by U. S. Industrial Chemicals, Inc., providing a new source of the feed supplement which insures rapid growth of farm animals and poultry. The development, accomplished by bacterial fermentation, promises feed efficiency said to represent a significant advance in animal nutrition. In the past, this vital factor has been produced in limited quantities as a by-product from antibiotic operations produced by mold, instead of direct fermentation as in the U.S.I. process.

The fermentation APF, as the feed component is known, has a vitamin B_{12} content approximately 40 times that of good fish meal, the outstanding natural source of APF which has been used widely heretofore in feed mixtures. This vitamin compound is one of the most effective known for supplementing chicken and hog feeds.

Plough Plans Addition To Memphis Plant

Plough, Inc., Memphis, Tenn., manufacturer of pharmaceuticals, has authorized Wigton-Abbott Corp., engineers and contractors of Plainfield, N. J., to proceed with the plans and specifications for the construction of a 150,000 sq. ft. addition

ISCO OPERATION News

OCTOBER, 1949

Montan Wax

A bituminous wax with M.P. of approximately 80° C. Widely used for electrical insulation, for polishes in the rubber industry, phonograph records, shoe polishes. Often used as a substitute for Carnauba and Beeswax.

Other Isco Waxes — Esparto, Candelilla, Carnauba, Beeswax, Ozokerite. Gum Arabic • Gum Tragacanth • Gum Ghatti • Irish Moss • Absorption Bases

ISCO

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BOSTON CHICAGO CLEVELAND CINCINNATI GLOVERSVILLE PHILADELPHIA

SUBSIDIARY E. S. BROWNING CO., INC. SAN FRANCISCO • LOS ANGELES

Right—for Rights-of-Way

and other brush control uses

Pittsburgh 10-20 BRUSH KILLER

Contains 2,4,5-T and 2,4-D Esters

Nothing is more savory than a juicy blackberry pie or the strong, sweet flavor of elderberry jelly—but the woody growth of these and other plants such as sumac, alder and osage orange can make a "jungle" out of public utility rights-of-way, grazing lands, farms and creek banks unless constantly controlled.

***Pittsburgh* 10-20 Brush Killer, a hormone type herbicide, containing 2,4,5-T and 2,4-D Esters, has proved much more effective than 2,4-D alone for control of such heavy underbrush and gives a permanent kill with one application when properly used. It may also be painted on fresh-cut stumps of poplar, willow and other persistent trees to prevent re-growth. Combined with *Pittsburgh* Phenolate-O, 10-20 Brush Killer may also be used as a general weed killer.**

***Pittsburgh* 10-20 Brush Killer is the answer to your brush-control problems. Full technical information about this effective chemical, and advice concerning its use, is available for the asking!**

10-20 Brush Killer effective on these plants:

Blackberry
Elderberry
Sumac
Osage Orange
Willow Alder
Buck Brush
Wild Cherry
Hawthorn
Black Locust
Poison Ivy
Cherokee Rose
Sage Brush
and many other woody plants

WRITE FOR TECHNICAL BULLETIN 302

PITTSBURGH AGRICULTURAL CHEMICAL COMPANY
Empire State Building • 350 Fifth Avenue • New York 1, New York

Affiliated with

PITTSBURGH COKE & CHEMICAL COMPANY
1952 Grant Building • Pittsburgh 19, Pa.

COAL CHEMICALS • ACTIVATED CARBON • NEVILLE COKE • EMERALD COAL • PIG IRON • GREEN BAG CEMENT • CONCRETE PIPE AND PRODUCTS

to and the remodeling of an existing one-story structure it recently acquired in Memphis.

The new plant will house all research laboratories, manufacturing lines, printing and box manufacturing equipment, warehouse, shipping and office facilities now scattered in eight different locations throughout the city, in addition to a cafeteria.

New Emulsions Booklet

A new edition of Carbide and Carbon Chemicals Corp.'s "Emulsions" booklet, which for fifteen years has been a reliable guide for those interested in wax polishes, industrial emulsions, cosmetics and soluble oils, has just been published. The title of the Eighth Edition has been broadened to "Emulsions and Detergents." A new section covers cleaners and detergent specialties; the old text has been revised to include new technical information, tested and proven in Carbide's laboratories and in industrial applications. The emulsion chemist will realize, however, that even proven formulas must usually be adjusted for the particular requirements of the individual.

New Specifications for Hardwood Floor Finishes

New specifications covering finishes for hardwood floors have been issued for the Maple Flooring Manufacturers Association by Foster D. Snell, Inc., New York chemical consulting firm and official laboratory for the Association.

The 1949 specifications which became official on September 1st, 1949, amend and supersede those issued in 1946. They establish standards for finishes for both heavy duty and gymnasium floors and are designed to give users of these products the benefit of technological improvements in the intervening years. Products found to meet these specifications when tested by the official laboratory are placed on the MFMA approved list issued by the Association from time to time, and can be advertised and sold as approved.

Principal changes from previous specifications included in the present ones establish numerical values for several test properties left indefinite previously. Toughness is defined by a Kauri reduction test; minimum abrasion resistance for heavy duty finishes is set at an index number of 150 by Taber abraser (250 for gymnasium finishes); color must be not darker than No. 13 by Gardner Color Standard; Sward Hardness of the film must be at least 24; maximum viscosity is specified as A2 on the Gardner scale (C for gymnasium finishes); and a new test covers resistance to alcohol and naphtha.

Copies of the specifications can be had by those interested from Foster D. Snell, Inc., 29 West 15th Street, New York 11, N. Y., or from the Maple Flooring Manufacturers Association, 46 Washington Boulevard, Oshkosh, Wisc.

Residue Hearings Set For January

Hearings to establish regulations for limiting quantities of poisonous substances to be tolerated in or on foods will start in January, T. B. Bellis, of the Federal Food and Drug Administration, told the National Agricultural Chemicals Association meeting at Spring Lake, N. J., last month. Dr. Bellis outlined steps to be taken in organizing the hearings, which will set up rules regarding amounts of spray residue on food crops safe for human consumption.

In the elections held at the meeting, George F. Leonard, Tobacco By-Products & Chemical Corp., was succeeded as president by Ernest Hart, vice-president, Food Machinery & Chemical Corp., San Jose, Calif., and vice-president, Niagara Chemical Division. A former director of NACA, Mr. Hart has been in agricultural chemicals since he joined Niagara in 1914.

Why you should specify...

HOOKER MURIATIC ACID

IF YOU MANUFACTURE DYES—because Hooker Muriatic Acid is free from sulfates, oxides of nitrogen and iron, impurities that cause precipitates or add unwanted colors to benzidene dye.

IF YOU ARE REFINING HIGHGRADE ORES—because Hooker Muriatic Acid is free from sulfates or sulfuric acid, that cause serious losses in extraction.

IF YOU ARE MAKING PHARMACEUTICALS OR FOOD STUFFS—because Hooker Muriatic Acid is free from sulfates, iron and arsenic, that cause insoluble precipitates, discoloration or contamination.

IF YOU ARE PICKLING OR CLEANING METALS — because Hooker Muriatic Acid is free from arsenic, that may react with liberated hydrogen to form Arsine (AsH_3).

IF YOU MANUFACTURE CHEMICALS—because Hooker Muriatic Acid is of such high quality that you get better yields of better quality and without harmful side reactions.

* * *

Hooker Muriatic Acid is available in two grades—commercial (light yellow color) and Hooker White— (colorless) both free from arsenic. It is shipped in carboys or tank cars and in three strengths, 18°, 20° and 22° Baume. Hooker Technical Data Sheet No. 720 gives Hooker specifications, dilution instructions and other valuable information. Send for a copy on your company letterhead.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

HOOKER CHEMICALS

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9-1143

SODIUM SULFIDE • SODIUM SULFHYDRATE • SODIUM TETRASULFIDE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE

FOR YOUR INFORMATION

HERE'S A LIBRARY OF TECHNICAL INFORMATION ON CHEMICALS

If you are connected with a company that uses chemicals, an extensive library of technical literature is available to you from Monsanto. Many of Monsanto's staple products, as well as many that are brand new, have had literature written about them. On these pages is listed some of this literature. You may have printed material you want simply by filling in the coupon, circling the numbers that correspond to the bold-face number at the left of each listing.

If you have any problems involving chemistry or plastics on which you think Monsanto might be of help, write any Monsanto Sales Office or direct to Monsanto headquarters, St. Louis 4, Missouri. Your inquiry will be given prompt attention.

Valuable Reference Book on Chemicals and Plastics

1. General Catalog: *Monsanto Chemicals and Plastics* (28th Edition). Here's a valuable reference book for any person or company using a number of chemicals or plastics. The 28th Edition contains 176 pages (8½ x 11 inches) and describes more than 400 products. If you use chemicals or plastics in quantity, send for your free copy of the 28th Edition of "Monsanto Chemicals and Plastics."

Heavy Chemicals and Intermediates

Scores of Monsanto Products are classified as intermediates or heavy chemicals. Many of them are staples in industry and are not covered by special literature, but are included in the "28th Edition, Monsanto Chemicals and Plastics." Others have uses other than as intermediates and literature is listed under the classification in which the specialized use falls. For example: *ortho*-Dichlorobenzene is an intermediate for dyestuffs and also an insecticidal chemical. Literature is listed in the insecticidal group.

The following printed material is available on heavy chemicals and intermediates:

2. Booklet: *Chlorine (Monsanto).*

3. Folder: *Chemicals for Water Treatment.*

4. Folder: *Products for the Pulp and Paper Industry.*

Food Preservation

5. Booklet: *Benzoic Acid and the Benzoates.* This publication is packed with information that is extremely useful to anyone with a food or beverage preservation problem.

6. Folder: *Preserving with Sodium Benzoate.*

Sulfuric Acid Plants

7. Booklet: *Monsanto-Ross-Wilde Process.* If your business requires sulfuric acid in volume, this booklet is important reading. It tells you how you can save money by producing your own acid and how Monsanto will assist you with the latest, postwar designs for contact plants.

Aromas and Flavor Chemicals

8. Booklet: *Something About The Senses.* This publication gives an interesting history of the development and use of flavors and aromas, plus technical information.

9. Folder: *Coumarin.*

10. Folder: *Ethavan** (Monsanto's Ethyl Vanillin).

11. Folder: *Methyl Salicylate* (Synthetic oil of wintergreen).

12. Folder: *Vanillin.*

13. Folder: *Saccharin.*

Detergents and Wetting Agents

Monsanto Detergents and Wetting Agents are widely used in the manufacture of textiles, in cleaning compounds and in industrial cleaning. The following literature is available:

14. Booklet: *Santomerse* No. 1.* This is a thorough treatise on Santomerse No. 1, the all-purpose detergent and wetting agent.

15. Tech. Bulletin: *Sopanox.** (An amino compound to prevent rancidity and deterioration in soaps and vegetable oils.)

16. Tech. Bulletin: *SA-326 An Antioxidant For Soaps.*

17. Tech. Bulletin: *Santomerse D, S, No. 3 Paste.*

18. Tech. Bulletin: *Santomerse B.*

19. Tech. Bulletin: *Santomerse 30X.*

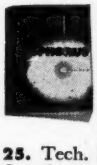
20. Reprint: *Builder With Synthetic Detergents.*

21. Reprint: *Evaluation of Surface-Active Agents.*

22. Folder: *Santomerse No. 1.*

23. Folder: *Chemistry In Cleaning.*

Phosphates



24. Booklet: *Phosphorus The Light Bearer.* The interesting story of phosphorus, from its discovery to its present-day production and use, is presented in non-technical terms in this booklet.

25. Tech. Bulletin: *Tetra Potassium Pyrophosphate.*

26. Tech. Bulletin: *Tetra Sodium Pyrophosphate.*

27. Tech. Bulletin: *Phosphoric Acid.*

28. Tech. Bulletin: *Fire Retardant B.*

29. Tech. Bulletin: *Fire Retardant A.*

30. Tech. Bulletin: *Santowax* R.*

31. Tech. Bulletin: *HB-40.** (Clear, mobile, high-boiling hydrocarbon.)

32. Tech. Bulletin: *Mixed Isomeric Terphenyls.*

33. Tech. Bulletin: *Alkyl Acid Phosphates.*

34. Tech. Bulletin: *Alkyl Alkali Phosphates.*

35. Tech. Bulletin: *Isocyanates.*

36. Folder: *Sodium Acid Pyrophosphate.*

Miscellaneous Literature

37. Tech. Bulletin: *Santosite** (*Sodium Sulfite Anhydrous, Technical*) *For Removing Oxygen From Boiler Feed Water.*

38. Folder: *Santosite the Milder Pulping Agent.*

39. Booklet: *Skydrol.** (Skydrol is a flame-resistant hydraulic fluid for airplanes.)

News of Monsanto Chemicals for the Process Industries.....October, 1949

The Aroclors

40. Tech. Bulletin: *The AROCLORS** (Chlorinated biphenyl and chlorinated polyphenyls). This gives you a broad picture of the AROCLORS . . . their properties and their applications.

41. Tech. Bulletin: *AROCLORS As Used In Pliolite S-5.*

42. Tech. Bulletin: *AROCLORS As Co-Polyvinylchloride.*

43. Tech. Bulletin: *AROCLORS Used to Extend or Substitute Carnauba Wax.*

44. Tech. Bulletin: *AROCLOR 1254—Co-plasticizer with DOP for Vinyl Organosols and Pastes.*

45. Tech. Bulletin: *AROCLOR—A Nonflammable Hydraulic Fluid.*

46. Tech. Bulletin: *AROCLOR 1254 —Lubricant and Plasticizer.*

47. Reprint: *AROCLOR 1248—Heat-Transfer Medium.*

Santobrite

Santobrite* (Sodium Pentachlorophenate, Technical) is used to control slime and algae in the pulp and paper industry, in cooling towers and elsewhere. Santobrite also controls sap stain in lumber and preserves such products as adhesives and rubber latex.

48. Tech. Bulletin: *Santobrite for the Preservation of Adhesives.*

49. Tech. Bulletin: *Santobrite for the Control of Slime and Algae.*

50. Booklet: *Sap Stain Control.*

Petroleum Additives

Monsanto's oil additives, developed to make good lubricants better, include those that make oils pour freely in cold weather, those which improve viscosity, those which keep motor parts clean and those that enable refiners to make one gear lubricant that serves in both conventional and hypoid gears. Details on these products can be found in the following literature:

51. Booklet: *Science and Oil.* This booklet tells how additives take up where nature left off in the production of superior lubricants.

52. Booklet: *Detergent Oil Additives.*

Wood Preservation and Termite Control

MONSANTO PENTAchlorophenol (Santophen* 20) gives positive protection against termites, wood-boring insects and decay caused by fungi.

53. Booklet: *Penta, Best Protection for Poles and Crossarms.*

54. Folder: *Building With Santophen 20 Preserved Wood.*

55. Folder: *Fence Posts — Make Them Last With Penta.*

56. Folder: *Santophen in Industrial Construction.*

57. Reprint: *Wood-Preserving Applications With Monsanto Penta.*

Chemicals to Control Mildew

58. Progress Report: *Milmer*1—A Safe, Effective Industrial Preservative.*

59. Progress Report: *Guide to Formulating and Applying Milmer 1.*

60. Tech. Bulletin: *Milmer 1 — Physical, Chemical and Biological Properties.*

61. Tech. Paper: *Preservation of Cotton Fabrics With Copper 8-Quinolinolate.*

Insecticidal Chemicals

62. Booklet: *Santobane* (DDT)*, telling where and how to use Santobane to destroy bothersome insects.

63. Tech. Bulletin: *Nifos*-T. Organic Phosphate Insecticide.*

64. Folder: *Nifos-T. Monsanto's New, Improved Insect-Killer.*

65. Tech. Bulletin: *Santochlor* for Control of Peach-Tree Borer.*

66. Tech. Bulletin: *Santochlor — Properties and Applications.*

67. Booklet: *Santochlor for Clothes Moth Control.*

68. Folder: *ortho-Dichlorobenzene.*

Herbicidal Chemicals

69. Progress Report: *2,4,5-T . . . A Herbicide for Brush and Woody Plants.*

70. Tech. Bulletin: *2,4-D for Weed Control.*

71. Booklet: *Killers in the Field.*

Disinfectant

72. Tech. Bulletin: *Santophen 1 for use in disinfectants.*

Pest Control

73. Folder: *Pest Control.*

74. Tech. Bulletin: *Compound 1080** (Most effective of all rodenticides.)

Plasticizers and Resins

75. Booklet: *Monsanto Plasticizers . . .* a thorough presentation of Monsanto's complete line of plasticizers.

76. Booklet: *Santicizer* 141.*

77. Folder: *Monsanto Santicizers.*

Rubber Chemicals

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• CHEMICAL INDUSTRIES presents here a catalog of new chemicals and chemical specialties introduced by its advertisers since August, 1948. Chemicals and specialties are grouped separately in alphabetical order. These products will be displayed in CHEMICAL INDUSTRIES' exhibits at the Pacific Chemical Exposition, San Francisco Civic Auditorium, November 1-5, and at the 22nd Exposition of Chemical Industries, Grand Central Palace, New York City, November 28 - December 3.

ACETPHENOLISATIN

$C_{20}H_{19}O_5N$. M.W., 401.16; M.P., 240°. White, odorless, tasteless powder; insoluble in water and dilute HCl. Used in medicine as a laxative. Available in commercial quantities. Chemo Puro Mfg. Corp.

1-ACETYLAMINO-6-HYDROXYNAPHTHALENE

$C_{10}H_6(NHCOCH_3)$ (OH). M W, 201; M P, 210°C (minimum). Dark grey crystalline solid about 100% strength as molecular weight 201. Soluble in ethanol and in aqueous alkaline solutions. Insoluble in water. Suggested for use as a pharmaceutical and dyestuff intermediate. Available in experimental quantities. National Aniline Division, Allied Chemical & Dye Corp.

ACETYL AMINOPHENOL

$C_6H_4OH.NHCOCH_3$. N. W., 151; Colorless, odorless crystals of slightly bitter taste; soluble in water. Used in medicine as analgesic. Available in commercial quantities. Chemo Puro Mfg. Corp.

N-ACETYL MORPHOLINE

$CH_3CONCH_2CH_2OCH_2CH_2$ M.W., 129.2; Sp. G., 1.1164 @ 20/20°C.; B.P., 152°C. (50 mm.); F.P, 14°C.; R.I., 1.4838 @ 20°C.; soluble in water in all proportions. Uses: dyestuff solvent; source of acetic acid or morpholine under certain conditions. Available in semicommercial quantities. Carbide and Carbon Chemicals Corp.

ACETYL TRIMETHYLPENTYL CITRATE

$C_{20}H_{40}O_8$. M.W., 486.6; B.P., @ 1 mm, above 225°C; R.I., @ 23.5°C.; 1.4453; Sp.G., @ 25°C., 1.002. Evaporation rate (gm/cm²/hr.) @ 105°C. 0.000002. Assay Minimum 99%. Colorless to very slight yellow tinge; liquid; an ester having an exceptionally low vapor pressure and water solubility and highly compatible with vinyl resins. Uses: Plasticizer. Availability: Pilot plant. Chas. Pfizer & Co., Inc.

ACONITIC ACID

$C_6H_6O_6$. M.W., 174.11; M.P., 195°C. with decomposition; solubility in water @ 25°C., 26.4 gm/100 ml; solubility in water @ 90°C., 110.7 gm/100 ml; solubility in ether, sparingly soluble; solubility in acetone, soluble; solubility in hydrocarbons, low. White crystalline powder. Unsaturated tricarboxy acid undergoes usual acid reactions, forming normal esters and salts, acid esters and salts, an anhydride, amide and an acid chloride. Double bond can be sulfonated and halogenated. Hydrogenation yields tricarballylic acid. Heating dilute solutions at boiling point gives itaconic acid. Uses: Resins, plasticizer formation, stabilizer, chemical intermediate. Availability: Available in commercial quantities. Chas. Pfizer & Co., Inc.

ALKYLAMINE HYDROCHLORIDES

Diethylamine monohydrochloride: M.W., 109.56. M.P., 223°; B.P., 320°. Diethylamine = 66.72%. Monomethylamine monohydrochloride: M.W., 67.51; M.P., 225°; B.P., 225°/15 mm. Monomethylamine = 46%. Ethylenediamine dihydrochloride: M.W., 133.01. Sublimes without melting; Ethylenediamine = 45.17%. Other alkylamine hydrochlorides can be made to order. Used in syntheses wherever the use of alkylamines in aqueous solutions or in gas form is impracticable. Available in commercial quantities. Chemo Puro Mfg. Corp.

ALLYL AMINE (2-Propenylamine)

CH_2:$CHCH_2NH_2$; commercial grade. M.W., 57.09; Sp.G., 0.760 @ 20°/20°C.; R.I., 1.4194 @ 22°C.; boiling range, 51-52.5°C. (760 mm.); miscible with water, alcohol and ether; soluble in chloroform; colorless to light yellow liquid; strong ammoniacal odor. Chemical properties: Free from diallyl- and triallylamine. The reactivity of the amino group is enhanced by the presence of the double bond; typical reactions at the double bond. Suggested uses: In the manufacture of mercury diuretics; as a dyestuff intermediate; as a resin raw material; an intermediate in organic syntheses. Availability: Commercial quantities. The Edwal Laboratories, Inc.

ALLYL MERCAPTAN (2-Propene-1-Thiol)

CH_2: $CHCH_2SH$. Commercial grade. M.W., 74.14; Sp.G., 0.930 @ 25°/25°C.; R.I., 1.476 @ 25°C.; boiling range 67-68° (760 mm.); miscible with alcohol and ether; insoluble in water; colorless to light yellow liquid; strong garlic-like odor. Chemical properties: The above properties are those of the freshly distilled material. Allyl mercaptan polymerizes on aging with increase in color, refractive index, specific gravity and boiling range. Suggested uses: Garlic flavoring ingredient; pharmaceutical intermediate; resin raw material; vulcanization accelerator (British Patent 286,749); possible ingredient for processing cold rubber. Availability; Commercial quantities. The Edwal Laboratories, Inc.

ALLYL PHENYL ETHER

$C_9H_{10}O$. M.W., 134.2; clear, colorless liquid. Solubility at 25°C.; practically insoluble in water, completely miscible in common organic solvents. Boiling range at 760 mm. Hg, 5-95%, 191.0-198.4°C. Sp.Gr. at 25/25°C. 0.978. Freezing point, below —20°C. R.I. at 25°C. 1.520. Flash point 80°C. Fire point 82°C. Semi-commercial quantities. Dow Chemical Co.

ALUMINUM ACETATE Powdered

A dry powder aluminum acetate easily placed in solution to arrive at the same properties as standard commercial solutions of aluminum acetate (tech.) containing approximately 4.5% aluminum oxide (AL_2O_3). Specifications: AL_2O_3 content approx. 13.5%; free acid, none; iron (as Fe) .02% max.; sulfate, in bound form only; color white. For use in manufacturing water repellent finishes for paper, fabrics and leather; used also as a dye mordant and in the preparation of lakes and pigments. Stahl Finish Co.

ALUMINUM BENZOATE

$Al(C_7H_5O_2)_3$. M.W. 390.09. White crystalline powder. Very slightly soluble in water. Use: Retardant in rubber vulcanizing. Available in experimental quantities. City Chemical Corp.

ALUMINUM DISTEARATE #401

Comb. Al_2O_3, 8.4-8.9%. Medium gel. Moisture content, 0.5-1.0%. Bulk average: 65-70 fl. oz./lb. White powder; M.P., 145-150°C.; 95% thru 200 mesh. Slight odor. Soluble in chlorinated solvents, mineral spirits, mineral oils, waxes, benzol, toluol and xylol. Insoluble in water, lower alcohols and esters. Use: Paints, varnish, lacquer, inks, crayons, cordage, waterproofing and wire drawing. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

ALUMINUM DISTEARATE #402

Comb. Al_2O_3, 9.0-9.5%. High gel. Moisture content, 0.5-1.0%. Bulk average: 65-70 fl. oz./lb. White powder; M.P., 160-165°C.; 95% thru 200 mesh. Slight odor. Soluble in chlorinated solvents, mineral spirits, mineral oils and waxes, benzol, toluol and xylol. Insoluble in water, lower alcohols and esters. Use: Lubricating grease, paints, plastics, crayons, pencils. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

ALUMINUM DISTEARATE #403

Comb. Al_2O_3, 8.5-9.0%. Extra high gel. Moisture content 0.5-1.0%. Bulk average: 55-60 fl. oz./lb. Whitish powder; M.P., 160-165°C.; 95% thru 200 mesh. Slight odor. Soluble in chlorinated solvents, mineral spirits, mineral oils, waxes, benzol toluol and xylol. Insoluble in water, lower alcohols and esters. Use: Lubricating grease, paints. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

ALUMINUM MONOSTEARATE #405

Comb. Al_2O_3, 9.0-9.5%. Medium-high gel. Moisture content, 0.3-0.8%. Bulk average: 65-70 fl. oz./lb. White powder; M.P., 165-170°C.; 95% thru 200 mesh. Slight odor. Soluble in chlorinated solvents, mineral spirits, mineral oils, waxes, benzol toluol and xylol. Insoluble in water, lower alcohols and esters. Use: Paints, varnish, lacquer, cordage, ink, crayons, plastics, textile grease. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

ALUMINUM TANNATE, BASIC

Approx. $Al(OH)_2(C_{14}H_9O_9)_3$. $5H_2O$. M.W., 793. Brownish yellow powder. Insoluble in water; soluble in alkalies. Decomposed by acids. Use: Astringent Available in experimental quantities. City Chemical Corp.

ALUMINUM TARTRATE

Approx. $Al_2(C_4H_4O_6)_3$. M.W., 498. White crystal powder. Slowly soluble in cold water, readily in hot. Insoluble in alcohol. Available in experimental quantities. City Chemical Corp.

ALUMINUM TRISTEARATE #404

Comb. Al_2O_3. 6.0-6.5%. Low gel. Moisture content, 0.5-1.0%. Bulk average: 55-60 fl. oz./lb. White powder; M.P., 115-120°C.; 95% thru 200 mesh. Slight odor. Soluble in chlorinated solvents, mineral spirits, mineral oils, waxes, benzol, toluol and xylol. Insoluble in water, lower alcohols, esters. Use: Paints, varnish, lacquer, waterproofing compounds. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

m-AMINOBENZOTRIFLUORIDE

$NH_2C_6H_4CF_3$. M.W., 161.13; Sp.G., 1.303 at 15.5°/15.5°C.; R.I., 1.481 at 20°C.; B.P., 189°C.; Flash P., 87°C.; F.P., 3°C.; odor, aniline-like; color, colorless (turns brown on exposure to light). Chemical properties: The CF_3 group is chemically stable. One or both hydrogens in the NH_2 group may be substituted. Other reactions are possible. Suggested uses: In the synthesis of dyestuffs. Availability: Pilot plant quantities. Hooker Electrochemical Co.

N-AMINOPROPYL MORPHOLINE

$H_2NC_3H_6NCH_2CH_2OCH_2CH_2$. M.W., 144.2; Sp. G., 0.986 @ 20/20°C.; B.P., 223°C. (760 mm.); R.I., 1.4765 @ 20°C.; soluble in water in all proportions. Uses: intermediate for textile finishing agents and pharmaceuticals. Available in commercial quantities. Carbide and Carbon Chemicals Corp.

p-AMINOSALICYLIC ACID

$C_6H_3(OH)(NH_2)COOH$. M.W., 153.3; white to light tan powder; soluble in alcohol, insoluble in water. M.P. about 145°C. with decomposition. Suggested for use in chemotherapy, particularly of tuberculosis, and as intermediate. Available in commercial quantities. Monsanto Chemical Co.

AMMONIUM BINOXALATE

$NH_4HC_2O_4.H_2O$. M.W., 125.06. Colorless rhombic crystals. Soluble in 25 water. Possible uses: Removal of ink stains, laundry sour, dyeing aid. Amend Drug & Chemical Co.

$NH_4HC_2O_4.H_2O$. M.W., 125.06. Colorless rhombic crystals. Soluble in water; slightly soluble in alcohol. Grades: Tech., C.P. Use: Remove ink stains. Available in pilot plant quantities. City Chemical Corporation.

AMMONIUM CHLORIDE
(Standard Luminescent)

NH_4Cl. M.W., 53.50. A white, odorless powder; sublimes without melting; soluble in water. An unusually high purity ammonium chloride. Suggested uses: Manufacture of halo phosphate phosphors. Availability: Commercial quantities. Mallinckrodt Chemical Works.

AMMONIUM GLUCONATE
(Technical)

$NH_4(C_6H_{11}O_7)$. M.W., 213.19. Assay: Min., 99%. Solubility in water @25°C., min. 30 gm/100 ml.; solubility in alcohol, slightly soluble; solubility in ether, insoluble. White crystalline powder; slight yellowish tint. Readily water-soluble catalyst for textile printing pastes is completely stable. It provides a very mildly acidic medium for the development of vat-soluble ester dyes and acidic dyestuffs. Also exhibits some metal-sequestering ability. Uses: Dyeing. Availability: Commercial quantities. Chas. Pfizer & Co., Inc.

AMMONIUM PHOSPHOTUNGSTATE

$(NH_4)_3PO_4.12WO_3.3H_2O$. M.W., 2987.18. Heavy white powder. Slightly soluble in cold water. Uses: Analytical reagent, production of dye lakes. Amend Drug & Chemical Co.

AMMONIUM SELENITE

$(NH_4)_2SeO_3$. M.W., 163.0 White or sl. reddish crystals. Very soluble in water. Uses: Mfgr. red glass, reagent for alkaloids, moth proofing. Available in experimental quantities. City Chemical Corp.

AMMONIUM TRIIODATE

$NH_4I_3(IO_3)_3$. M.W., 545. White crystals; very soluble in water. Available in experimental quantities. City Checimal Corp.

ANTIMONY OXIDE
(Standard Luminescent)

Sb_2O_3. M.W., 288.4.. White, odorless powder. Insoluble in water, slightly soluble in dilute H_2SO_4, or dilute HNO_3; soluble in HCl, in solutions of alkali hydroxides, in warm tartaric acid solutions. A pure antimony trioxide. Suggested uses: Manufacture of halo phosphate phosphors. Availability: Commercial quantities. Mallinckrodt Chemical Works.

l-ARTERENOL BITARTRATE

3,4-$(OH)_2$ - C_6H_3-CHOH - CH_2NH_2.HOOC-CHOH-CHOH-COOH.H_2O. M.W., 337.3. M.P., 102-4°; optical rotation at 25° (D, 1.6% in H_2O), —11°. White crystals. Synonyms: 3,4-dihydroxyphenylethanolamine, norepinephrine, noradrenalin, norsuprarenin, demethylated epinephrine. Found in the proportion of 10-18% in natural epinephrine preparation; can be isolated from suprarenal glands. Differs from epinephrine in effect on blood pressure and other physiological phenomena. Suggested uses: Investigation of metabolism and physiological activity. Availability: Small quantities for experimental investigation. Winthrop-Stearns, Inc.

BARIUM BORATE
(Meta)

$Ba(BO_2)_2.XH_2O$. Light white powder. Slightly soluble in water; soluble in acids. Available in pilot plant quantities in technical and C.P. grades. City Chemical Corp.

BARIUM BOROTUNGSTATE

$2BaO.B_2O_3.9WO_3.18H_2O$. M.W., 2788.64. Large white crystals, rapidly effloresce in air. Very soluble in water. Available in experimental quantities. City Chemical Corp.

BARIUM CITRATE

$Ba_3(C_6H_5O_7)_2.7H_2O$. M.W., 916.27. White powder, loses all water at 150°. Insol. water, sol. dil. HCl or HNO_3. Insol. alcohol. Available for experimental quantities. City Chemical Corp.

BARIUM COBALTICYANIDE

$Ba_3(Co(CN_6)_2$. M.W., 844. Yellow crystals. Soluble in water. Available in experimental quantities. City Chemical Corp.

BARIUM FERROCYANIDE

$Ba_3(Co(CN)_6)_2$. M.W., 844. Yellow crystals. tals. Slightly soluble in hot water, less in cold. Insoluble in alcohol. Use: Catalyst in ammonia synthesis. Available in experimental quantities. City Chemical Corp.

BARIUM MOLYBDATE

$BaMoO_4$. M.W., 297.4. White powder. Very slightly soluble in water; soluble in hot, dil. HCl or HNO_3. Available in experimental quantities. City Chemical Corp.

BARIUM STEARATE #501

Comb. BaO, 26-27%. Moisture content, 0.3-0.8%. Bulk average, 75-80 fl. oz./lb. White powder; M.P., 250-260°C.; 100% thru 200 mesh. No odor. Insoluble in water, lower alcohols, esters, chlorinated solvents, mineral spirits, mineral waxes, oils, benzol, toluol and xylol. Use: Artificial leather, plastics, rubber. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

BARIUM TRICHLOROACETATE

$(Cl_3C{\cdot}OO)_2Ba$. M.W., 462.13. White crystals. Very soluble in water. Available in experimental quantities. City Chemical Corporation.

BENZIL

$(C_6H_5CO)_2$. M.W., 210.22. Fine, light tan powder; almond-like odor; M.P., 95°C.; B.P., 346-8°C. (sl. dec.); Sp.G., @ 15°/15°, 1.23; soluble in alcohol, ether; insoluble in water. Chemical properties—undergoes many typical carbonyl reactions as well as reactions characteristic of β-diketones. Suggested uses: as an insecticide; in the manufacture of pharmaceuticals and dyestuffs. Available in pilot plant quantities. Heyden Chemical Corp.

BENZYL AMINE

$C_6H_5CH_2NH_2$. M.W., 107.15. Colorless liquid; R.I., 1.5401; Sp.G. @ 20°/4°, 0.9826; B.P., 185°C.; soluble in water, alcohol, ether. Chemical properties: Similar to those of aliphatic amines. Suggested uses: In the manufacture of pharmaceuticals and dyestuffs. Available in pilot plant quantities. Heyden Chemical Corp.

o-BENZYL-p-CHLOROPHENOL
(Santophen 1®)

$C_6H_5CH_2C_6H_4ClOH$. M.W., 218.6; M.P., 49°C.; B.P., 175°C. at 5 mm.; white to tan flaked solid. Soluble in alcohols and alkalies. Faint, pleasantly phenolic odor. Highly toxic to both gram positive and gram negative bacteria and to fungi. Suggested as active ingredient in disinfectant formulations and in other microbiological control. Literature: Tech. Bull. No. 0-51. Available in commercial quantities. Monsanto Chemical Co.
*Trademark Registered

BENZYL METHYL AMINE

$C_6H_5CH_2NHCH_3$. M.W., 121.1. Colorless liquid; B.P., 180-182°C.; Sp.G. @ 25°/25°, 0.9416; R.I., 25°C./D.-1.5202. Suggested uses: Intermediate in the preparation of pharmaceuticals. Pilot plant quantities available. Heyden Chemical Corp.

BENZYL SULFONAMIDE

$C_6H_5CH_2SO_2NH_2$. M.W., 171. White crystalline solid; M.P., 99-101°C. Soluble in alcohols, ketones, esters, ethers; slightly soluble in water; insoluble in hydrocarbons, chlorinated compounds. Chemical properties: Slowly hydrolyzed in aqueous solutions at ordinary temperatures. Suggested uses: Intermediate in the synthesis of various pharmaceuticals and dyestuffs. Available in pilot plant quantities. Heyden Chemical Corp.

BENZYL SULFONYL CHLORIDE

$C_6H_5CH_2SO_2Cl$. M.W., 190. White crystalline solid; M.P., 91°-92°C. Soluble in acetone; slightly soluble in methanol; insoluble in water, mineral spirits. Chemical properties: Hydrolyzed by aqueous alkalies; reacts with amino and hydroxyl groups. Suggested uses: Intermediate for the modification of dyestuffs, pharmaceuticals, plasticizers, and other synthetic chemicals. Available in pilot plant quantities. Heyden Chemical Corp.

BENZYL TRIMETHYL AMMONIUM HYDROXIDE
(35% Methanol Solution)

A 35% methanol solution of benzyl trimethyl ammonium hydroxide, equivalent in basicity to sodium and potassium hydroxides. Is compatible with most organic systems where inorganic alkalies are not. May be of interest for increasing the rate or yield of base catalyzed reactions. It does not show the oxidizing effects often obtained with caustic, thus it may give better yields or better color. Stable at temperatures up to 50° C. Decomposes at an increasing rate at temperatures above 50° C. At about 145° C., completely decomposed. Availability: Pilot plant quantities. Rohm & Haas Co.

BIS (2-BROMOETHYL) ETHER

$C_4H_8Br_2O$. M.W., 231.9. Slightly yellow liquid. Solubility at 25°C.: Practically insoluble in water; soluble in n-heptane; completely miscible in common solvents. Boiling range at 20 mm. Hg. 5-95%. 103.2-106.9°C. Sp.G. at 25/25°C., 1.849. F.P., below —20°C. R.I. at 25°C., 1.511. No flash point or fire point. Semi-commercial quantities. Dow Chemical Co.

BIS (DIMETHYLBENZYL) CARBONATE
(Mixed Isomers)

$(CH_3)_2C_6H_3CH_2OCOOCH_2C_6H_3(CH_3)_2$. M.W., 298.37; Sp.G., 1.083 @ 25°/4°C.; R.I., 1.5442 @ 25°C.; B.P., 215-222°C. (4 mm.); vapor pressure @ 150°C., less than 0.1 mm., @ 200°C., 1.3 mm.; ester value 97%; acidity, none; F.P., about —19°C.; viscosity, 155 cp. @ 20°C., 4 cp. @ 100°C., 2200 cp. @ 0°C.; surface tension, 34 dynes/cm. @20°C.; thermal expansion, (10-40°C.), 0.00072 gms./cc/°C.; flash point, 415°F. (213°C.); fire point, 463°F. (239°C.); power factor @ 1000 cps. @ 25°C., less than 0.001; DC resistivity @ 25°C., greater than 10^8 megohm-cm.; insoluble in water; solubility, water in, 0.2% @ 25°C.; insoluble or limited solubility in polar solvents; completely miscible with most non-polar solvents; compatible with many polymers; odor, characteristic aromatic; color, practically water-white. Chemical properties: Undergoes ordinary ester reactions but is much more resistant to hydrolysis; decomposes to the aralkyl chloride in the presence of mineral acids and acyl chlorides; decomposes to aralkyl ether at moderate temperatures in the presence of certain metal salts. Suggested uses: Plasticizer and solvent in the plastic, surface coating, printing ink and textile fields; lubricant additive, heat transfer medium, hydraulic fluid, perfume additive, flavor concentrate, fungicide and insecticide. Availability: Pilot plant quantities for experimental purposes Ohio-Apex, Inc.

BIS (IMINOAMINOMETHYL) DISULFIDE OXALATE

$NH_2(NH)\ CS_2C(NH)(NH)_2.2(COOH)_2\ ½\ H_2O$. M.W., 339/. White crystalline solid melting with decomposition at about 130° C. Very soluble in hot water. Suggested for use in the preparation of sponge articles from rubber, polyvinyl chloride and other plastic materials. Availability: Experimental quantities. Monsanto Chemical Co.

BISMUTH TARTRATE

Approx. $Bi_2(C_4H_4O_6)_3.6H_2O$. M.W., 970.2. White powder. Insoluble in water or alcohol; soluble in alkali hydroxide solutions or acids. Available in experimental quantities. City Chemical Corp.

BIS (TRIFLUOROMETHYL) BENZENE

$CF_3C_6H_4CF_3$. M.W., 214.11. Sp.G., 1.395 at 20°/15.5° C.; R.I., 1.3798 at 20° C.; B.P., 114.4° C.; Fl.P., 37° C.; F.P., —40° to —50° C. Odor, aromatic; color, water white. Chemical properties: May be nitrated and the nitro compound reduced to the amino. Suggested uses: In the synthesis of nonflammable dielectric or hydraulic fluids and dyestuffs. Availability: Pilot plant quantities. Hooker Electrochemical Co.

p-BROMOACETANILIDE

$BrC_6H_4NHCOCH_3$. M.W., 214. White crystals with melting point 168-169° C. Semi-commercial quantities. Dow Chemical Co.

p-BROMOANILINE

$BrC_6H_4NH_2$. M.W., 172. White to buff crystals with melting point 63-64° C. Semi-commercial quantities. Dow Chemical Co.

1-BROMO-4-CHLOROBENZENE

BrC_6H_4Cl. M.W., 191.5. White to faintly yellow crystals with melting point 65-66° C. B.P. at 25 mm. Hg, 91° C.; at 760 mm. Hg, approx. 196° C. Semi-commercial quantities. Dow Chemical Co.

α-BROMOLAURIC ACID

$C_{10}H_{21}CHBrCO_2H$. A tan, low melting solid prepared by the bromination of commercial lauric acid. Suggested for use in the synthesis of surface active agents, pharmaceuticals, insecticides, petroleum additives, etc. Available in experimental quantities. Sapon Laboratories, Inc.

α-BROMOMYRISTIC ACID

$C_{12}H_{25}CHBrCO_2H$. A yellow, low melting solid prepared by the bromination of commercial myristic acid. Of interest in the synthesis of surface active agents, pharmaceuticals, insecticides, petroleum additives, etc. Available in experimental quantities. Sapon Laboratories, Inc.

α-BROMOPALMITIC ACID

$C_{14}H_{29}CHBrCO_2H$. A yellow, low melting, waxy solid prepared by the bromination of commercial palmitic acid. Suggested for use in the synthesis of surface active agents, pharmaceuticals, insecticides, rust inhibitors, petroleum additives, etc. Available in experimental quantities. Sapon Laboratories, Inc.

β-BROMOPROPIONITRILE

C_3H_4BrN. M.W., 134.0. Yellow liquid. Solubility at 25° C.: Slightly soluble in water; completely miscible in common organic solvents; practically insoluble in n-heptane. Boiling range at 10 mm. Hg. 5-95%, 71-76° C. Sp. G. at 25/25° C., 1.625. F.P., below —20° C. No flash point or fire point. Semi-commercial quantities. Dow Chemical Co.

α-BROMOSTEARIC ACID

$C_{16}H_{33}CHBrCO_2H$. A yellow to tan, low melting, waxy solid prepared by the bromination of commercial stearic acid. The reactivity of the bromine and carboxyl groups and the presence of the long hydrocarbon chain make this material of interest for heavy chemical as well as fine chemical investigation. Suggested for use in the synthesis of surface active agents, pharmaceuticals, insecticides, rust inhibitors, petroleum additives, etc. Available in semi-commercial quantities. Sapon Laboratories, Inc.

n-BUTYLANILINE

$C_{10}H_{15}N$. M.W., 149.2. A clear, light yellow liquid. Boiling range at 760 mm. Hg, 240.0-241.5° C. Sp.G. at 25/25° C., 0.931. F.P., below —20° C. R.I. at 25° C., 1.533. F.P., 118° C. Fire point, 121° C. Solubility at 25° C.: Practically insoluble in water; completely miscible in common organic solvents. Semi-commercial quantities. Dow Chemical Co.

n-BUTYL ANTHRANILATE

$C_4H_9CO_2C_6H_4NH_2$. Colorless to tan-colored liquid. B.P., 120° C./2 mm. Characteristic odor of anthranilates. Useful for perfume and flavoring compounds. Fairmount Chemical Co., Inc.

t-BUTYL HYDROPEROXIDE

$(CH_3)_3C(OOH)$. M.W., 90.12. Commercial t-butyl hydroperoxide is a mixture of t-butyl hydroperoxide, di-t-butyl peroxide, t-butyl alcohol and a small amount of water. Typical analysis: t-butyl hydroperoxide, 60.0%; active oxygen, 10.6%. Fl.P., above 60° F. A water-white liquid with Sp.G. at 25° C., 0.86. Soluble in common organic solvents; partially soluble in concentrated solutions of alkali metal hydroxides; slightly soluble in water. Useful in bleaching, pharmaceutical, or other applications requiring a stable, weakly acidic, liquid type organic oxidizing agent, and as a polymerization catalyst in bulk or emulsion processes with commercial monomers including styrenes, methacrylates, or polyester resins. The pure alkaline earth persalts of this hydroperoxide may be prepared. Available in commercial quantities, samples on request. Lucidol Division, Novadel-Agene Corp.

2-BUTYLOCTANOL-1

$C_4H_{11}CH(C_4H_9)CH_2OH$. M.W., 184.3; Sp. G., 0.8348 @ 20/20° C.; B.P., 244-249° C. (760 mm.); R.I., 1.4425 @ 20° C. Chemical properties: Can be esterified with various organic and inorganic acids. Suggested uses: Foam breaker; intermediate in the manufacture of nonionic and anionic detergent and surface-active agents, and special purpose plasticizers. Available in research quantities. Carbide and Carbon Chemicals Corp.

tert-BUTYL PERBENZOATE

$C_6H_5CO(O_2)C(CH_3)_3$. M.W., 194.22. Purity, 95.0% minimum; active oxygen, 7.8% minimum; Fl.P., above 70°F. A slightly straw colored liquid with Sp.G. at 25° C., 1.04. Soluble in common organic solvents; insoluble in water. Useful in bleaching, pharmaceutical, or other applications requiring a stable, neutral, liquid type perester, and as a high temperature polymerization catalyst in bulk or emulsion processes with commercial monomers such as vinyl type or polyester resins. Available in commercial quantities, samples on request. Lucidol Division, Novadel-Agene Corp.

p-tert-BUTYLPHENOXYACETIC ACID

$C_{12}H_{16}O_3$. M.W., 208.2. Light tan needle crystals with a slight musty odor. M.P., 95.8-96.4° C. Solubility at 25° C.: Practically insoluble in water; completely miscible in common organic solvents; slightly soluble in VMP naphtha. Semi-commercial quantities. Dow Chemical Co.

α-(p-tert-BUTYLPHENOXY) PROPIONIC ACID

$C_{13}H_{18}O_3$. M.W., 222.3. Light pink powder. M.P., 87.1-89.0° C. Solubility at 25° C.: Practically insoluble in water; soluble in common organic solvents; slightly soluble in n-heptane. Semi-commercial quantities. Dow Chemical Co.

CADMIUM POTASSIUM IODIDE

$CdI_2.2KI.2H_2O$. M.W., 734.31. White crystals; turn yellow on standing. Very soluble in water; soluble in alcohol. Use: Testing for alkaloid, and for peroxide in ether. Available in experimental quantities. City Chemical Corp.

CADMIUM TARTRATE

$CdC_4H_4O_6$. M.W., 260.48. White powder. Slightly soluble in water; soluble in acids and ammonium hydroxide. Available in experimental quantities. City Chemical Corp.

CALCIUM BICHROMATE

$CaCr_2O_7.3H_2O$. M.W., 310.15. Reddish-brown crystals. Very soluble in water. Available in experimental amounts. City Chemical Corp.

CALCIUM BROMATE

$Ca(BrO_3)_2.H_2O$. M.W., 313.9. White crystals or powder. Readily soluble in water. Available in experimental quantities. City Chemical Corp.

CALCIUM CARBONATE (Standard Luminescent)

$CaCO_3$. M.W., 100.09. White, odorless, tasteless powder, decomposed into CaO and CO_2 at about 825° C. Insoluble in water, dissolves in dilute acids with effervescence. An unusually high purity precipitated calcium carbonate, particularly with respect to sodium. Suggested uses: Manufacture of halo phosphate phosphors and other phosphors. Availability: Commercial quantities. Mallinckrodt Chemical Works.

CALCIUM FLUORIDE (Standard Luminescent)

CaF_2. M.W., 78.08. White powder; insoluble in water, slightly soluble in dilute acids. An unusually high purity calcium fluoride. Suggested uses: Manufacture of halo phosphate phosphors and other phosphors. Availability: Commercial quantities. Mallinckrodt Chemical Works.

CALCIUM PHOSPHATE DIBASIC (Standard Luminescent)

$CaHPO_4$. M.W., 136.07. White crystalline powder; almost insoluble in water; soluble in dilute HCl or HNO_3. An unusually high purity calcium phosphate. Suggested uses: Manufacture of halo phosphate phosphors and other phosphors. Availability: Commercial quantities. Mallinckrodt Chemical Works.

CALCIUM STEARATE #601

Comb. CaO, 9.0-9.5%. Moisture content: 0.5-1.0%. Bulk average: 90-100 fl. oz./lb. White powder. M.P., 135-140° C.; 100% through 200 mesh. Slight odor. Insoluble in water, lower alcohols, esters, chlorinated solvents, mineral spirits mineral oils, waxes, benzol, toluol and xylol. Use: Dry cleaning soaps, waterproofing compounds, drugs, pharmaceuticals, plastics, paints, varnish, lacquer and crayons. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

CALCIUM STEARATE #602

Comb. CaO, 9.0-9.5%. Moisture content, 0.5-1.0%. Bulk average: 45-50 fl. oz./lb. White powder. M.P., 135-140° C.; 65-70% through 200 mesh. Slight odor. Insoluble in water, lower alcohols, esters, chlorinated solvents, mineral spirits, mineral oil, waxes, benzol, toluol and xylol. Use: waterproof cement concrete. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

β-CARBOXYETHYL BENZOTHIAZYL-2 SULFIDE

$C_7H_4NS_2CH_2CH_2COOH$. M.W., 239.; M.P., 139-141° C. Physical state, light buff colored crystals. Soluble in sodium hydroxide solutions; slightly soluble in water; may be recrystallized from alcohol. Suggested use: Chemical intermediate. Availability: Experimental quantities. B F. Goodrich Chemical Co.

CESIUM BROMIDE

CsBr. M.W., 212.83. Colorless crystals or white granules, non-hygroscopic. M.P., 636° C. Sp.G. of solid, 4.44. Very slightly soluble in 95% ethanol; soluble in water at 25° C. Cesium bromide resembles potassium chloride but has some unique properties such as a high water solubility, high density, somewhat lower melting point than other alkali chlorides and bromides, and the ability to form a polybromide that is fairly stable. Suggested as an economical and convenient starting material for preparation of other cesium compounds for use as analytical reagents or in microchemistry. Semi-commercial quantities. Dow Chemical Co.

CETYLDIMETHYLBENZYLAMMONIUM HEXAFLUOPHOSPHATE

$(C_{16}H_{33})(C_6H_5CH_2)(CH_3)_2NPF_6$ M.W., 505.6; melts without apparent decomposition at about 65° C. Very slightly soluble in water; about 10 g. dissolved in 100 ml. benzene at room temperature; 1.5 g. in n-hexane. About 80% purity. Considered of potential value as fungicidal and bactericidal agent of low solubility, and consequent resistance to weathering and leaching. Available in experimental quantities. Ozark-Mahoning Co.

CETYL TRIMETHYL AMMONIUM BROMIDE

A technical grade of this chemical produced as a 60% paste. Suggested as a surface active agent for special applications where liquid interfaces are involved. Availability: Semi-commercial. Onyx Oil & Chemical Co.

CHLOROACETALDEHYDE (40-50% Solution)

C_2H_3ClO. M.W., 78.5. Pure compound has boiling point 84.5° C. Polymerizes rapidly. Soluble in common organic solvents and water. Forms azeotrope containing 15 per cent water. Two molecules form hydrate with one molecule water. F.P., 36° C. Hydrate crystallizes from solutions stronger than 50 per cent. Suggested as drug intermediate. Semi-commercial quantities. Dow Chemical Co.

o-CHLOROBENZONITRILE

ClC_6H_4CN. M.W., 137.57. B.P., 232°C.; M.P., 42.43°C.; Soluble in alcohol, ether; slightly soluble in hot water. Chemical properties: Those typical of both the aromatic chloro and cyano groups. Suggested uses: organic syntheses. Availability: research quantities. Genesee Research Corp.

o-CHLOROCINNAMIC ACID

$ClC_6H_4CHCHCOOH$. M.W., 182.6. Yellow crystals. M.P., 208°-213° C. Soluble in ether, benzene; slightly soluble in ketones; insoluble in cold water, alcohols. Chemical properties: Unsaturated acid of high molecular weight. Suggested uses: In the synthesis of pharmaceuticals, dyestuffs, and other organic compounds. Available in pilot plant quantities. Heyden Chemical Corporation.

1-CHLORO-2,2-DIFLUOROPROPANE

$CH_3CF_2CH_2Cl$. M.W., 114.53; D., 1.2001 @ 20°/4° C.; R.I., 1.3520 @ 20° C.; B.P., 55° C.; insol. in water; odor, sweet; color, water-white. Suggested uses: In the preparation of fluorganics such as refrigerants and inert solvents. Availability: Research quantities. Halogen Chemicals, Inc.

2-CHLORO-4,6-DINITROPHENOL

$C_6H_3ClN_2O_5$. M.W., 218.6. Yellow crystals. Solubility at 25° C.: practically insoluble in water, slightly soluble in n-heptane and carbon tetrachloride, soluble in acetone, benzene, ether, and methanol. Semi-commercial quantities. Dow Chemical Co.

2-CHLORO-5-NITROBENZOTRIFLUORIDE

$C_6H_3CF_3[2\text{-}Cl,5\text{-}NO_2]$; M.W., 225.56; Sp.G., 1.552 at 25°/15.5° C.; R.I., 1.5009 at 20° C.; B.P., 230.0°C.; Flash P., 135°C.; Last Crystal P., 16.8° C.; odor, aromatic; color, straw. Suggested uses: In the synthesis of dyestuffs. Availability: pilot plant quantities. Hooker Electrochemical Co.

p-CHLOROPHENOXYACETIC ACID

$C_8H_7ClO_3$. M.W., 186.6. Fine, light tan crys-

tals with melting point 154.9-157.3° C. Solubility at 25° C.: practically insoluble in benzene, carbon tetrachloride, n-heptane and water, slightly soluble in ether, soluble in acetone and in methanol. Semi-commercial quantities. Dow Chemical Co.

p-CHLOROPHENOXYACETIC ACID

$ClC_6H_4OCH_2COOH$. M.W., 186.6; M.P., about 157° C.; white crystalline powder. Soluble in most organic solvents, slightly soluble in water, soluble in hot alkali. Suggested as a plant hormone. Available in pilot plant quantities. Monsanto Chemical Co. Organic Division.

MONOCHLOROPHTHALIC ANHYDRIDE

$ClC_6H_3(CO)_2O$. M.W. 182.5; cryst. pt. about 65°C.; white, crystalline powder. Soluble in most organic solvents, insoluble in water, soluble in alkalies with the formation of alkali salt. Forms esters readily. Suggested for use in resins and as an intermediate. Available in semi-commercial quantities. Monsanto Chemical Co.

β-CHLOROPROPIONITRILE

C_3H_4ClN. M.W., 89.5. Colorless liquid. Solubility at 25°C.: completely miscible in common organic solvents, practically insoluble in VMP naphtha and in water. Boiling point at 760 mm. Hg., 178°C. Sp.Gr. at 25/25°C., 1.138. Freezing point, below —20°C. Flash point, 200°F. Fire point, 200°F. Semi-commercial quantities. Dow Chemical Co.

CHLOROSTEARIC ACIDS

Mono- through hexachlorostearic acids, chlorines substituted in alpha, beta, etc., positions by substitution in fully saturated stearic acid. Range from soft waxes to viscous liquids, pale lemon to amber in color. M.W., 300-500; unsaponifiable, 1% max.; ash, 0.25% max.; iron, 0.01% max.; heavy metals, trace. Suggested uses: detergent and lathering agent for soaps and cleaning compounds, flotation agent, plasticizer, soldering flux, extreme pressure lubricant additive. Availability: commercial. Filmite Oil Corp.

CHOLINE CITRATE MONOBASIC

M.P., 105-107°. M.W., 295.29. Choline, 41%. White, slightly hygroscopic, crystalline powder of acid taste. Very soluble in water; slightly soluble in alcohol. Used in medicine for the treatment of liver diseases, and in multivitamin preparations. Available in commercial quantities. Chemo Puro Mfg. Corp.

COBALT ARSENATE

$Co_3(AsO_4)_2 \cdot 8H_2O$. M.W., 598.76. Violet lumps or purple powder. Insoluble in water, soluble in dilute mineral acids and in ammonium hydroxide. Available in experimental amounts. City Chemical Corp.

COPPER STANNATE

$Cu\ SnO_3 \cdot 3H_2O$. M.W., 284.3. Pale blue powder. Insoluble in water, soluble in ammonium hydroxide. Available in experimental quantities. City Chemical Corp.

p-CRESYL BENZOATE

$C_6H_5.CO_2.C_6H_4.CH_3$. M.W., 212.24. M.P., 71°-72°C; B.P., 315-316°C.; soluble in methanol, ethanol, insoluble in water. Suggested uses: as an insecticide. Available in pilot plant quantities. Heyden Chemical Corp.

CYCLOHEXANOL
(Hexalin* R)

A redistilled grade of hexahydrophenol or cyclohexanol, $C_6H_{11}OH$. A water-white liquid solvent of 152-162°C. boiling range. For use by manufacturers of drycleaning soaps and others to whom the KOH color test is important. Available in commercial quantities. E. I. du Pont de Nemours & Co. (Inc.) *Trademark.

CYCLOHEXANONE PEROXIDE
(Technical)

Mixture of at least two diffrent cyclohexanone peroxides. 1-hydroxycyclohexyl hydroperoxide-1, $CH_2(CH_2)_4C(OOH)(OH)$, is the principal constituent. Purity, 90.0% minimum; Active Oxygen, 13.0% minimum; M. P., 75°-80°C. White granular solid; soluble in common organic solvents, insoluble in water. An excellent catalyst for use in room or slightly elevated temperature cures of commercial polyester resins. Also used as a catalyst in bulk or emulsion polymerization of vinyl type monomers. Available in pilot plant quantities. Lucidol Division Novadel-Agene Corp.

1-CYCLOHEXYLAMINO-2-PROPANOL

$C_9H_{19}NO$. M.W. 157.3. A light brown, crystalline solid. M.P. 43.4°C. Solubility at 25°C.; slightly soluble in water, soluble in common organic solvents. Suggested as a drug intermediate. Semi-commercial quantities. Dow Chemical Co.

CYCLOHEXYL CHLORIDE

$C_6H_{11}Cl$. M.W., 118.61; D., 1.0000 @ 20.3°/4°C.; R.I., 1.4626 @ 20°C.; B.P., 143°C. (760 mm.); insol. in water; odor, sweet; color, white to pale amber. Chemical properties: contains a reactive chlorine atom. Suggested uses: In the synthesis of pharmaceuticals and other organic chemicals in which the introduction of the cyclohexyl group is desired. Availablility: Pilot-plant quantities. Halogen Chemicals Inc.

DECANOLS, MIXED

A mixture of C-10 alcohols composed chiefly of 2-ethyl octanol-1 and 2-butyl hexanol-1 together with a trace of secondary alcohols. Sp.G., 0.8398 @ 20/20°C.; Initial B.P., 220.0°C. (760 mm.); Dry P., 224.5°C.; Acidity 0.0021% as acetic acid; water, 0.020%; purity, 94.0%. Chemical properties: reacts with ethylene oxide or chlor sulfonic acid to yield surface-active agents. Suggested uses: of interest to the flotation, plasticizer, textile, and lubricant additive industries; as a high-temperature defoaming agent. Available in drum quantities. Carbide and Carbon Chemicals Corp.

DEHYDROACETIC ACID
(DHA*)

$C_8H_8O_4$. M.W., 168.1. White to cream crystalline powder. M.P., 109-111°C. (sublimes). Solutions are stable to heat at 120-130°C. for one hour. A food stabilizer which is colorless, odorless and tasteless in all concentrations suitable for use. Solubility at 25°C.: practically insoluble in water and glycerine; slightly soluble in carbon tetrachloride, 95% ethanol, ether, n-heptane, methanol, olive oil, and propylene glycol; moderately soluble in acetone, benzene and paraffin waxes. Inhibits or kills bacteria, fungi and yeasts that are commonly encountered in cosmetics, food and beverage processing. Semi-commercial quantities. Dow Chemical Co.
* Trademark.

DIALLYL CYANAMIDE

$(C_3H_5)_2NCN$. M.W., 108.2; colorless liquid; B.P., 60-61°C. (3 mm.); density, d_4^{25}, 0.9056; R.I., n_D^{25}, 1.4609; slightly soluble in water; miscible with most organic solvents. Chemical properties: Readily hydrolyzed to the corresponding urea or the amine; easily converted to the corresponding guanidine or thiourea; reacts with alcohols to form alkyl isoureas and with dicyandiamide to form the dialkylmelamine. Suggested uses: Intermediate for organic syntheses; solvent, especially for resins. Availability: Trial-lot quantities for experimental investigation. American Cyanamid Co.

DIAMMONIUM PHOSPHATE
(Dentifrice Grade)

$(NH_4)_2HPO_4$. M.W., 132. M.P., decomposes around 170°C. A colorless crystalline solid with Ng 1.528, Nm 1.516 and Np 1.509. Solubility in water, 36.5% at 10°C. A diammonium phosphate which gives brilliant water solutions. Suggested uses: In the preparation of ammoniated tooth powders, pastes, and mouth washes. Availability: Commercial quantities. Victor Chemical Works.

p-DIAZO ETHYL HYDROXYETHYLANILINE ZINC CHLORIDE

Synonym, Edwal Compound No. 10; CIN: $NC_6H_4N(C_2H_5)CH_2CH_2OH \cdot \frac{1}{2}ZnCl_2$; M. W., 295.83; soluble in water; fine, crystalline, free-flowing powder; color, cream to yellow. Chemical properties: A stabilized, light-sensitive diazo compound; reacts with coupling agents to produce colored, stable, water-fast dyes. Suggested uses: Light-sensitive ingredient for coating direct positive, rapid reproduction papers. Availability: Commercial quantities. The Edwal Laboratories, Inc.

p-DIAZO DIETHYLANILINE ZINC CHLORIDE

Synonym, Edwal Compound No. 9; CIN: $NC_6H_4N(C_2H_5)_2 \cdot \frac{1}{2}ZnCl_2$; M.W., 279.83; soluble in water; fine, crystalline, free-flowing powder; color, cream to yellow. Chemical properties: A stabilized, light-sensitive diazo compound; reacts with coupling agents to produce colored, stable, water-fast dyes. Suggested uses: Light-sensitive ingredient for coating direct positive, rapid reproduction papers. Availability: Commercial quantities. The Edwal Laboratories, Inc.

DIBENZYL AMINE

$(C_6H_5CH_2)_2NH$; M.W., 197.27; colorless oil; Sp.Gr., 25/25°-1.028; M.P., —26°C.; B.P., 268°-71°C. @ 250 mm.; insoluble in water; soluble in alcohol, ether. Chemical properties: forms an addition compound with hydrogen sulfide. Suggested uses: as an intermediate in organic syntheses. Available in pilot plant quantities. Heyden Chemical Corp.

1,3-DIBROMOBUTANE

$BrCH_2CH_2CHBrCH_3$. M.W., 216. Colorless to faintly yellow liquid. B.P. at 50 mm. Hg, 90-91°C.; at 760 mm. Hg., 176-177°C. Sp. Gr. at 25/25°C. 1.786. Semi-commercial quantities. Dow Chemical Co.

1,4-DIBROMOBUTANE
(Tetramethylene Bromide)

$BrCH_2CH_2CH_2CH_2Br$. M.W., 216. Colorless to faintly yellow oil. B. P. at 10 mm. Hg. 73°C; at 760 mm. Hg. 198-199°C. Sp. Gr. at 25/25°C. 1.823. No flash or fire point below boiling point. Semi-commercial quantities. Dow Chemical Co.

1,2-DIBROMO-3-CHLOROPROPANE

$CH_2ClCHBrCH_2Br$. M.W., 236.3. Slightly yellow, neutral liquid. B. P. at 10 mm. Hg, 74°C; at 760 mm. Hg, approx. 200°C. Semi-commercial quantities. Dow Chemical Co.

1,4-DIBROMOPENTANE

$CH_3CHBrCH_2CH_2CH_2Br$. M. W., 229.96; B P. 99°C. @ 14 mm.; insol. in water; odor, sweetish; color, waterwhite to pale amber. Chemical properties: Contains reactive secondary and primary bromine atoms. Suggested uses: In the preparation of pharmaceuticals and other organic chemicals. Availability: Pilot-plant quantities Halogen Chemicals Inc.

2,3-DIBROMOPROPANOL

$BrCH_2CHBrCH_2OH$. M.W., 218. A colorless to faintly yellow oil. B.P. at 10 mm. Hg, 97-98°C.; at 760 mm. Hg, 229-230°C. Sp.Gr. at 25/25°C. 2.137. No flash or fire point below 150°C. Semi-commercial quantities. Dow Chemical Co.

1,2-DIBROMOSUCCINIC ACID

$HOOCCHBrCHBrCOOH$. M.W., 276. White to faintly yellow crystals. M.P. 240-241°C. Semi commercial quantities. Dow Chemical Co.

N,N-DIBUTYLANILINE

$C_6H_5N(C_4H_9)_2$; M.W. (calcd.), 205.3; color, amber; odor, faint aniline; boiling range, 263-275°C.; Sp.Gr. at 20°/20°C., 0.905; viscosity at 25°C., 5.06 centipoises; flash point, 230°F. Suggested uses: dyestuff intermediate, diazo printing. Available in pilot plant quantities. Sharples Chemicals, Inc.

DI-t-BUTYL DIPERPHTHALATE

$C_6H_4[CO(O_2)C(CH_3)_3]_2$; M.W., 310.34; Purity, 95% minimum; Active oxygen, 9.8% minimum; M.P., 52°-56°C. White granular solid; soluble in common organic solvents, insoluble in water. An unusually stable solid perester compound. Useful as a high temperature polymerization catalyst in bulk or emulsion processes with commercial monomers of the vinyl and polyester types. Available in pilot plant quantities. Lucidol Division, Novadel-Agene Corp.

DIBUTYL MALEATE

$C_4H_9OCOCH:CHCOOC_4H_9$. M.W., 222.3; Sp. G., 0.9964 @ 20/20°C.; B.P., 280.6°C. (760 mm.); F.P. sets to a glass below —85°C; V.P., 0.01 mm. Hg @ 20°C.; coefficient of expansion, 0.00089/°C.; R.I., 1.4451 @ 20°C.; viscosity, 5.9 cps. @ 20°C.; Flash P., 260°F. (Cleveland Open Cup); sol. in water, <0.01% by wt. @ 20°C.; sol. of water in, 0.64% by wt. at 20°C.; color, water-white. Chemical properties: Polymerizes in the presence of peroxide catalysts or in aqueous dispersions in the presence of oxygen-yielding compounds. Copolymerizes with active monomers such as vinyl chloride, vinyl acetate, vinylidene chloride, butadiene, and isopropenyl acetate. Reacts with chlorine, bromine, hydrogen chloride, and hydrogen to make the dibutyl ester of dichlorosuccinic acid, dibromosuccinic acid, chlorosuccinic acid, and succinic acid, respectively Adds sodium bisulfite to the double bond to form a surface-active agent. Undergoes Diels-Alder reaction to yield the corresponding cyclic diester. Uses: resins for coatings, films, molded and cast products, and impregnating agents. Available in commercial quantities. Carbide and Carbon Chemicals Corp.

$(=CHCO_2C_4H_9)_2$

M.W., 228.3; density at 25°C., 0.9907; refractive index, n_D at 25°C., 1.4435; viscosity at 25°C., 4.99 centipoise. Reactive, unsaturated ester which forms addition products with many chemicals. Useful as a raw material for synthesis, especially where the longer alkyl chain is preferred to the methyl and ethyl groups. Available in experimental quantities Commercial Solvents Corp.

3,4-DICHLOROACETOPHENONE

$C_8H_6OCl_2$. M.W., 188.9. White crystals. M.P., 74-76°C. Soluble in carbon tetrachloride, carbon disulfide, 95% ethanol, acetone, insoluble in water. Semi-commercial quantities. Dow Chemical Co.

4,4'-DICHLOROBENZOPHENONE

$(C_6H_4Cl)_2CO$; M.W., 251; colorless crystalline solid; M.P., 147°-8°C.; B.P., 353°C.; soluble in ether, acetic acid, chloroform, carbon bisulfide, acetone. Chemical properties: this compound undergoes many of the usual reactions of ketone. Suggested uses: as an intermediate in organic syntheses. Available in pilot plant quantities. Heyden Chemical Corp.

1,2-DICHLORO-1-FLUOROETHANE

$CHClFCH_2Cl$. B.P., 73-75°; d^{20}, 1.3814; n^{20}, 1.41132. A colorless liquid of characteristic chlorohydrocarbon odor; insoluble in water and soluble in alcohol and ether. Uses: research inter-

mediate; Availability: research quantities. Columbia Organic Chemical Co.

1,2-DICHLORO-2-FLUOROPROPANE

$CH_3CFClCH_2Cl$. M.W., 130.99; D., 1.2618 @ 20°/4°C.; R.I., 1.4121 @ 20°C.; B.P., 88.5° C. (760 mm.); insol. in water; odor, sweet; color, waterwhite. Suggested uses: In the synthesis of organic fluorine chemicals. Availability: Research quantities. Halogen Chemicals, Inc.

DI (n-DECYL) ADIPATE (Hylene* D Plasticizer)

$C_{10}H_{21}OOC(CH_2)_4COOC_{10}H_{21}$. M. W. 427; clear, colorless liquid above M.P., 26°C; B.P. at 5 mm., 244°C; Sp.G. 0.9039 at 30°/4°C; R.I. N_D^{25}°C., 1.4480; viscosity at 35°C., 13.7 cps; flash point 450°F. A plasticizer characterized by its excellent low temperature properties, good efficiency, low volatility, and adaptability for use in plastisols. Recommended for blending with other plasticizers to improve low temperature properties. Compatible with polyvinyl chloride, polyvinyl chloride-acetate, nitrocellulose, ethyl cellulose and polystyrene. Suggested for use as a plasticizer for vinyl resin films, solution coatings, dispersion coatings, and extruded and molded vinyl resins, particularly where excellent low temperature properties are desired. Available in commercial quantities. E. I. du Pont de Nemours & Co. (Inc.). *Trademark.

3-DIETHYLAMINOPROPYLAMINE

$(C_2H_5)_2NCH_2CH_2CH_2NH_2$. M.W . (calcd.), 130.2; color, water white; boiling range, 165-170°C.; Sp.G. at 20°/20°C., 0.825; refractive index, 1.443; flash point, 125°F. Suggested uses: Intermediate for surface active agents and pharmaceuticals. Available in pilot plant quantities. Sharples Chemicals, Inc.

DIETHYL CYANAMIDE

$(C_2H_5)_2NCN$. M.W., 84.2; colorless liquid; B.P., 188°C. (760 mm.); F.P., −81°C.; Sp.G., 0.8678; R.I. n_D^{25}, 1.4198; flash point, 71°C.; solubility in water, 8%; miscible with 10% HCl and most organic solvents; good solvent for most natural and synthetic resins. Chemical properties: Readily hydrolyzed to the corresponding urea or the amine; easily converted to the corresponding guanidine or thiourea; reacts with alcohols to form alkyl isoureas and with dicyandiamide to form the dialkylmelamine. Suggestd uses: Intermediate for organic syntheses; solvent, especially for resins. Availability: Trial-lot quantities for experimental investigation. American Cyanamid Co.

DIETHYL FUMARATE

$(C_2H_5OOCCH:)_2$. M.W., 172.2; B.P. about 220°C.; Sp.Gr. 1.05 at 25°/25°C. Pale yellow, slightly viscous liquid; cryst. pt. about 0°C. Miscible with most organic solvents, immiscible with water. Suggested as copolymerizing agent in resin compositions, intermediate in formation of amides, and in Diels-Alder reactions. Available in pilot plant quantities. Monsanto Chemical Co.

DI (2-ETHYLHEXYL) ETHER (Dioctyl Ether)

$[C_4H_9CH(C_2H_5)CH_2]_2O$. M.W., 242.4; Sp.G., 0.8121 @ 20/20°C.; B.P., 269.4°C. (760 mm.); F.P., sets to a glass <−95°C.; coefficient of expansion, 0.00090/°C. @ 20°C.; R.I., 1.4325 @ 20°C.; absolute viscosity, 2.89 cps. @ 20°C.; sol. in water, < 0.01% by wt. @ 20°C.; sol. of water in, 0.03% by wt. @ 20°C.; color, waterwhite; forms a heterogeneous CBM with water (96.4% water by wt.), boiling at 98.8°C. Uses: A high-boiling, inert reaction media, i.e., for high-temperature Grignard reactions. Available in commercial quantities. Carbide and Carbon Chemicals Corp.

DI (2-ETHYLHEXYL) MALEATE

$C_4H_9CH(C_2H_5)CH_2OCOCH:CHCOOCH_2CH(C_2H_5)C_4H_9$. M.W., 340.5; Sp.G., 0.9436 @ 20/20°C.; B.P., 209°C. (10 mm.); F.P., sets to a glass below −60°C.; V.P., <0.01 mm. Hg @ 20°C.; coefficient of expansion, 0.00083/°C.; R.I., 1.4550 @ 20°C.; viscosity, 18.3 cps. @ 20°C.; Flash P., 365°F. (Cleveland Open Cup); sol. in water, <0.01% by wt. @ 20°C.; sol. of water in, 0.23% by wt. @ 20°C.; color, water white. Chemical properties: Polymerizes in the presence of peroxide catalysts or in aqueous dispersions in the presence of oxygen-yielding compounds. Copolymerizes with active monomers such as vinyl chloride, vinyl acetate, vinylidene chloride, butadiene, and isopropenyl acetate. Reacts with chlorine, bromine, hydrogen chloride, and hydrogen to make the di(2-ethylhexyl) ester of dichlorosuccinic acid, dibromosuccinic acid, chlorosuccinic acid, and succinic acid, respectively. Adds sodium bisulfite to the double bond to form a surface-active agent. Undergoes Diels-Alder reaction to yield the corresponding cyclic diester. Uses: Resins for films, molded and cast products, and impregnating agents; its vinyl acetate copolymer is a rubbery plastic and elastic coating material that dries to a hard, glossy, flexible film. The material is self-plasticized, chemically inert, and easy to apply. Available in commercial quantities. Carbide and Carbon Chemicals Corp.

DI-2-ETHYLHEXYL SULFIDE

$S[CH_3CH(C_2H_5)C_4H_9]_2$. M.W., 258.5; Sp.G., 0.848 @ 25/25°C.; B.P., 125°C. (0.5 mm.); R.I., 1.4620; insoluble in water. Suggested use: Nonvolatile anti-oxidant for certain thermoplastics. Available in semi-commercial quantities. Carbide and Carbon Chemicals Corp.

DI (2-ETHYL BUTYL) PHTHALATE

$C_6H_4(COOC_6H_{13})_2$. A clear, oily liquid, slightly aromatic. Ester content, 98%; Acidity (%/wt.) 0.01 maximum as phthalic acid; color (APHA), 200 maximum; Sp.Gr., 1.010. Chemical properties are midway between those of the dibutyl and dioctyl phthalates. Recommended for use as a plasticizer for polymers used in the preparation of lacquers, cable coatings, free films, molded articles, and as a perfume solvent and fixative. Commercially available. Tennessee Eastman Corp.

DIETHYL KETONE

$(C_2H_5)_2CO$. M.W., 86.1; Sp. G., 0.816 @ 20/20°C.; B.P., 101.4°C. (760 mm.) and 32°C. (50 mm.); V.P., 28 mm. Hg. @ 20°C.; viscosity, 0.47 cps. @ 20°C.; R.I., 1.392 @ 20°C.; F.P., −40°C.; sol. in water, 5.1% by wt. @ 20°C.; sol. of water in, 2.1% by wt. @ 20°C.; color, waterwhite. Has a boiling point intermediate between those of methyl ethyl ketone and methyl isobutyl ketone. Uses: as a solvent for vinyl resins and nitrocellulose in coatings; in synthesis of Vitamin A and pharmaceuticals. Available in commercial quantities. Carbide and Carbon Chemicals Corp.

DIETHYL THIONOCHLOROPHOSPHATE

$(C_2H_5O)_2PSCl$. M.W., 188.62. Appearance, colorless liquid. B.P., 45°C. at 3 mm. Sp.G., 25°/25°C., 1.193. Refractive index, N_D 1.4700. Suggested use: Intermediate in chemical synthesis. Availability: Semi-commercial quantities. Victor Chemical Works.

DIETHYL THIONOTHIOPHOSPHATE

$(C_2H_5O)_2PSSH$. M.W., 186.23. Colorless liquid. B.P., 73°C. at 3 mm. Sp.G., 25°/25°C., 1.2477. Refractive index, N_D 1.5099. Suggested use: Intermediate in chemical synthesis. Availability: Two qualities. High purity small sample for experimental investigation only. Crude material, about 85% purity, is dark colored and available in semi-commercial quantities. Victor Chemical Works.

1,1-DIFLUORO-1,2-DICHLOROETHANE

CF_2ClCH_2Cl, M.P., 101.2°; B.P., 46-48°; d^{20}, 1.4163; n^{20}, 1.36193. A colorless liquid of characteristic chlorohydrocarbon odor; insoluble in water and soluble in alcohol and ether. Uses: research intermediate; Availability: research quantities. Columbia Organic Chemicals Co.

DIHYDROSTREPTOMYCIN SULFATE

Highly potent antibacterial agent. Moderately low toxicity. A dry powder, stable for 24 months at room temperature, with dosages expressed in terms of the equivalent weight of streptomycin base. Uses: Pharmaceutical, particularly indicated in most cases of tuberculosis. Produces neurotoxicity less rapidly than streptomycin and may be used for prolonged periods of time before vestibular damage appears. Availability: Commercial. Charles Pfizer & Co.

N,N-DI-beta-HYDROXYETHYL-o-AND p-TOLUENE-SULFONAMIDE (Santicizer* 132)

$CH_3C_6H_3SO_2N(CH_2CH_2OH)_2$. M.W., 260.2; M.P. approx. 75°C.; light tan, waxy solid. Suggested for use as an intermediate in the manufacture of resins and plasticizers. Compatible with thermosetting resins including melamine, urea and phenolic types. Available in pilot plant quantities. Monsanto Chemical Co.
* Trademark.

1,6-DIHYDROXYNAPHTHALENE

$C_{10}H_6(OH)_2$. M.W., 160; M. P., 132-133°C (minimum). Nearly white crystalline solid about 100% strength as molecular weight 160. Soluble in water, ethanol, acetone, ether, and benzene. Suggested for use as a pharmaceutical and dyestuff intermediate. Available in experimental quantities. National Aniline Divsion, Allied Chemical & Dye Corp.

2,3-DIHYDROXYNAPHTHALENE-6-SODIUM SULFONATE

$C_{10}H_5(OH)_2(SO_3Na)$. M. W., 262. Nearly white crystalline solid about 95% strength as molecular weight 262. Soluble in water and insoluble in ethanol, acetone ether and other common organic solvents. Suggested for use as a coupler in diazotype printing and as a dyestuffs intermediate. Available in commercial quantities. National Aniline Division, Allied Chemical & Dye Corp.

2,3-DIHYDROXY-NAPHTHALENE 6-SULFONIC ACID, SODIUM SALT

Synonym, Edwal Coupler Compound 111; $(HO)_2C_{10}H_5SO_3Na$; M.W., 262.22; fine, flaky, cream crystals of high purity; gives a clear solution in water. Chemical properties: The two hydroxy groups activate coupling with diazonium salts such as Edwal Compound No. 8, giving light-stable and water-fast blue dyes. Suggested uses: Active coupling agent for coating direct positives, rapid reproduction papers. Availability: Commercial quantities. The Edwal Laboratories

DIISOAMYLAMINE

$(C_5H_{11})_2NH$. M.W. (calcd.), 157.29; clear, water white liquid; odor, amine; freezing point, below −60°C.; I.B.P., 184°C.; F.B.P., 192°C.; vapor pressure, log p= — 2496/T + 8.300; flash point, 160°F.; Sp.G. at 20°/20°C., 0.773; viscosity at 25°C; 1.26 centipoises. Use: As an intermediate. Available in pilot plant quantities Sharples Chemicals, Inc.

DIISOPROPYLAMINE

$[(CH_3)_2CH]_2NH$. M.W. (calcd.), 101.2; water white liquid; Sp.G. at 20°/20°C., 0.72-0.74; diisopropylamine content, 97.5% min.; viscosity at 25°C., 0.40 centipoise; flash point, less than 20°F. Use: Intermediate for organic synthesis. Available in commercial quantities. Sharples Chemicals, Inc.

DIISOPROPYL CYANAMIDE

$(C_3H_7)_2NCN$. M.W., 112.2; colorless liquid; B.P., 66°C. (5 mm.); density at 25°C., 0.850; R.I., n_D^{25}, 1.424; solubility in water, 1%; miscible with most organic solvents; good solvent for most natural and synthetic resins. Chemical properties: Does not undergo all the usual reactions of the substituted cyanamides due to steric effects. Suggested uses: Intermediate for organic syntheses; solvent, especially for resins. Availability: Trial-lot quantities for experimental investigations. American Cyanamid Co.

DIHYDRAZINE SULPHATE (Technical)

$(N_2H_5)_2SO_4$. M.P., 107°-112°C.; Density, min. 0.57, max. 0.72; Water solubility, 45% gram solution, 25°C.; 62.5% gram solution, 50°C. Purity, 98%; Acidity, 1% has a pH of 4.88 at 25°C. Stable colorless salt in flake form. Because of hygroscopic nature should be protected from undue exposure to atmosphere. Recommended for use as a carrier for hydrazine in organic reactions. More soluble than hydrazine acid sulfate and contains 14.9% more hydrazine per molecule of sulfate. Suggested direct uses: as pesticides, herbicides, for photographic purposes, as polymerizing catalysts, and as a reagent for reducing silver nitrate for silvering of mirrors. Availability: semi-commercial. Mathieson Chemical Corp.

2-DIMETHYLAMINOETHANOL

$C_4H_{11}NO$. M.W., 89.1. A clear, light brown liquid. Boiling range at 760 mm. Hg, 5-95%, 133-137°C. Sp.Gr. at 25/25°C. 0.888. Freezing point, below −20°C. R.I. at 25°C. 1.423. Flash point 48°C. Fire point 48°C. Completely miscible in water and common organic solvents. Semi-commercial quantities. Dow Chemical Co.

DIMETHYL BENZYL CHLORIDE (Mixed Isomers)

$(CH_3)_2C_6H_3CH_2Cl$. M.W., 154.66; Sp.G., 1.056 @ 25°/4°C.; R.I., 1.5369 @ 25°C.; B.P., 90% @ 103-105°C. (15 mm.); % Chlorine, 22.7%; insoluble in water; completely miscible with gasoline, benzene, ethyl alcohol and isopropyl ether; freezing point, about −35°C.; viscosity, 2.6 cp. @ 20°C.; surface tension, 36.0 dynes/cm. @ 20°C.; odor, penetrating and pungent, lachrymatory; color, water white to pale yellow. Chemical Properties: Undergoes the reactions typical of benzyl chloride and other aralkyl chlorides. Ease of replacement of chlorine atom is greater than for benzyl chloride. The chloromethyl group can be further halogenated, oxidized and reduced. The aromatic nucleus can be sulfonated, nitrated, halogenated, etc., with due regard for the activity of the substituent groups. Polymerization occurs readily above 150°C. and in the presence of UV light, metals and metallic salts, particularly those of iron, copper, aluminum and zinc. Suggested uses: In the synthesis of pharmaceuticals, plasticizers, dyes, germicides, insecticides, resins, perfume fixatives, flavorings, lubricant additives, solvents and other organic chemicals. Direct use as an extractant, degreasing solvent, fumigant, polymerization regulator and lachrymator. Availability: Pilot plant quantities for experimental purposes. Ohio-Apex, Inc.

DI (METHYL "CELLOSOLVE"*) MALEATE

$CH_3OC_2H_4OCOCH:CHCOOC_2H_4OCH_3$. M.W., 232.2; Sp.G., 1.446@ 20/20°C.; B.P., 163-165 (5-6 mm.); F.P., —7 to —8°C.; R.I., 1.4547 @ 20°C. Chemical properties: Polymerizes in the presence of peroxide catalysts or in aqueous dispersions in the presence of oxygen-yielding compounds. Copolymerizes with active monomers such as vinyl chloride, vinyl acetate, vinylidene chloride, butadiene, and isopropanyl acetate. Reacts with chlorine, bromine, hydrogen chloride, and hydrogen to make the di(methyl "Cellosolve") ester of dichlorosuccinic acid, dibromo-

succinic acid, chlorosuccinic acid, and succinic acid, respectively. Undergoes Diels-Alder reaction to yield the corresponding cyclic diester. Uses: Of interest for surface coating, casting resins, copolymer, and cross-linking applications. Available in semi-commercial quantities. Carbide and Carbon Chemicals Corp.
* Trade-Mark

DIMETHYL CYANAMIDE

$(CH_3)_2NCN$. M.W., 56.1; colorless, hygroscopic liquid with sharp, ethereal odor; B.P., 161°C. (760 mm.), 61°C. (20 mm.); F.P., —39° C.; Sp.G., 0.8863; R.I. n_D^{25}, 1.4079; flash point, 71°C.; miscible with water and most organic solvents; good solvent for most natural and synthetic resins. Chemical properties: Readily hydrolyzed to the corresponding urea or the amine; easily converted to the corresponding guanidine or thiourea; reacts with alcohols to form alkyl isoureas and with dicyandiamide to form the dialkylmelamine. Suggested uses: Intermediate for organic syntheses; solvent, especially for resins. Availability: Trial-lot quantities for experimental investigation. American Cyanamid Co.

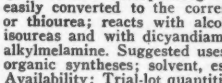
N,N-DIMETHYLCYCLOHEXYLAMINE

$C_6H_{11}N(CH_3)_2$. M.W. 127.2; B.P. about 160° C. Mobile, colorless liquid. Miscible with most organic solvents, slightly soluble in water, soluble in acids. Suggested for use as HCl scavenger, catalyst, and where tertiary amine is needed. Available in commercial quantities. Monsanto Chemical Co.

DIMETHYL FORMAMIDE

$HCON(CH_3)_2$. Colorless liquid; B.P. 152.8°C., M.P.-58.3°C.; Sp. Gr. 0.953—0.954 (15.6°/15.-6°C.); miscible with water and common organic solvents. Use: As a solvent for synthetic resins, acetylene, nitrocellulose, dyes and dye intermediates, alkaloids, inorganic salts and as a selective oil refining solvent. Containers: 55-gal. drums. E. I. du Pont de Nemours & Co. (Inc.)

2,6-DIMETHYL MORPHOLINE



Sp.G., 0.9346 @ 20/20°C.; B. P., 146.6°C. (760 mm.); R.I., 1.4462 @ 20°C.; soluble in water in all proportions. Uses: General solvent; fatty acid soaps as emulsifying agents. Available in semi-commercial quantities. Carbide and Carbon Chemicals Corp.

1,3-DIMETHYL THIOUREA

$CH_3NHCSNHCH_3$; M.W., 104; M.P., 57-60° C.; Solubility (g/100g)—water 35, ethyl alcohol 160, amyl acetate 39, ethylene glycol 15, trichloroethylene 1.0, toluene 0.5. Reactions: By analogy with other 1,3-di-substituted thioureas, can be expected to react usually in its tautomeric isothiourea form. Typical reactions would be—alkylation, preparation of guanidines, preparation of methylol derivatives, acylation. Suggested uses: It may be of interest as such, or as an intermediate, in pickling inhibitors, anti-oxidants, rubber chemicals, synthetic resins, pesticides, and pharmaceuticals. Availability: Pilot-plant quantities. Rohm & Haas Co.

DIOCTYL CHLOROPHOSPHATE

$(C_8H_{17}O)_2POCl$. M.W., 341. Refractive index, N_D 1.4459. Sp.G., 0.9839 at 25°C. B.P., 125°C. at 0.2 mm. Water white to very light straw color. Soluble in common organic solvents, insoluble in water. Hydrolyzes readily in hot alkali to form sodium dioctylphosphate. The active chlorine atom is capable of reacting with alcohol, glycols, and phenols to form neutral phosphorus-containing esters. Suggested use: Intermediate for organic synthesis. Availability: Semi-commercial quantities. Victor Chemical Works.

DITHIOBIURET

$H_2N—C(=S)—NH—C(=S)—NH_2$. M.W., 135; colorless crystalline solid; M.P., 193-195°C.; nearly insoluble in cold water; slightly soluble in hot water, dioxane, and pyridine; soluble in aqueous caustic, acetone, Cellosolve, and ethanol. Chemical properties: Reacts with alkylating agents, aldehydes, and ketones. Suggested uses: Intermediate for dyestuffs, pharmaceuticals, synthetic resins, and surface active agents. Availability: Trial-lot quantities for experimental investigation. American Cyanamid Co.

β-DITHIOCARBAMYLPROPIONIC ACID

$NH_2C(=S)SCH_2CH_2COOH$. M.W., 165; M.P., 124-126°C.; physical state, white crystals; slightly soluble in water, soluble in sodium hydroxide solutions, may be recrystallized from ether-patroleum ether solutions. Forms stable ammonium and zinc salts. Suggested use: Chemical intermediate. Availability: Experimental quantities. B. F. Goodrich Chemical Co.

DI (3, 5, 5-TRIMETHYLHEXYL) ADIPATE (Hylene* B Plasticizer)

$C_6H_{13}OOC(CH_2)_4COOC_6H_{13}$. M.W. 398; clear, colorless liquid; B.P. at 5mm., 206°C. F.P., -10°C; Sp.G. 0.9197 at 20°/4°C; R.I.$N_D^{25°C}$, 1.4453; viscosity at 25°C, 18.9 cps.; flash point, 415°F. A plasticizer characterized by its excellent low temperature properties, good efficiency, and adaptability for use in plastisols. Low temperature properties are maintained in blends with other plasticizers. Compatible with polyvinyl chloride, polyvinyl chloride-acetate, nitrocellulose, ethyl cellulose, and polystyrene. Suggested for use as a plasticizer for vinyl resin films, solution coatings, dispersion coatings and extruded and molded vinyl resins, particularly where excellent low temperature properties are desired. E. I. du Pont de Nemours & Co. (Inc.) *Trademark.

DI (3, 5, 5-TRIMETHYLHEXYL) DIGLYCOLATE (Hylene* C Plasticizer)

$C_6H_{13}OCOCH_2OCH_2COOC_6H_{13}$. M.W., 386; clear colorless liquid; B.P. at 5 mm., 195° C.; F.P., —45° C.; Sp.G., 0.9452 at 25°/4° C.; R.I., ND 25° C., 1.4452; viscosity at 25° C., 28.8 cps.; flash point, 405° F. A highly efficient plasticizer with good low temperature properties. Plastisols prepared with "Hylene" C have low initial viscosities and a low rate of viscosity increase. Compatible with polyvinyl chloride, polyvinyl chloride-acetate, nitrocellulose, ethyl cellulose, and polystyrene. Suggested for use as a plasticizer for vinyl resin films, solution coatings, dispersion coatings, and extruded and molded vinyl resins. Available in commercial quantities. E. I. du Pont de Nemours & Co. (Inc.) *Trademark.

ETHANOL-DIISOPROPANOLAMINE (Dow Alkanolamine 233)

A colorless liquid less viscous than Triethanolamine. M.W. 177. Freezing point, below —20° C. Sp.Gr. at 25/25°C. 1.0434. R.I. at 25°C. 1.4693. Latent heat, 95.5 calories per gram. B.P. at 760 mm. Hg, approx. 316.5°C. Suggested as a solubilizer for 2,4-D Acid and a substitute for Triethanolamine. Commercial quantities. Dow Chemical Co.

2-ETHOXYMETHYL 2,4-DIMETHYLPENTANEDIOL-1,5

$HOCH_2C(CH_3)(CH_3OC_2H_5)CH_2CH(CH_3)CH_2OH$. M.W., 190; SpG., 0.9805 @ 20/20°C.; R.I., 1.4578 @ 20°C.; B.P., 214°C. (100 mm.), 192°C. (50 mm.), and 156°C. (10 mm.); V.P., <0.01 @ 20°C.; F.P., sets to a glass below —30°C.; viscosity, 770 cps. @ 20°C.; Flash P., 300°F. (Cleveland Open Cup); sol. in water, 2.5% by wt. @ 20°C.; sol. of water in, 19% by wt. @ 20°C. Chemical properties: Combines the chemical characteristics of glycols and glycol ethers. Both alcohol groups are primary and are separated by five carbon atoms. Uses: Coupling agent and solvent for protective coatings, hydraulic fluids, duplicating fluids, metal cleaners, textile dyes, and adhesives; intermediates for maleic and alkyd resins, pharmaceuticals, surface-active agents, and dyestuffs; softener and plasticizer for casein and zein. Available in commercial quantities. Carbide and Carbon Chemicals Corp.

ETHYL α-BROMO-ISOBUTYRATE

$(CH_3)_2CBrCOOC_2H_5$. Intermediate for organic synthesis. Semi-commercially available. Consolidated Midland Corp.

ETHYL DIFLUOROMONOCHLOROACETATE

$CF_2ClCO_2C_2H_5$. B.P., 97°; d^{25} 1.252. A colorless liquid having a pleasant characteristically ester odor. Slightly soluble in water; readily soluble in alcohol. Uses: Research intermediate. Availability: Laboratory scale. Columbia Organic Chemicals Co.

ETHYL DIPHENYL PHOSPHATE (Santicizer 145*)

$(C_6H_5O)_2P(O)OC_2H_5$. M.W., 278.2; clear, practically colorless liquid. Sp.Gr., 1.20 at 25°/25°C.; refr. index, 1.53 at 25°C. Miscible with most organic solvents, immiscible with water. Suggested as a flame-proof plasticizer for cellulosics and other resins. Available in commercial quantities. Monsanto Chemical Co.
*Trade Mark.

2-ETHYLHEXYL 3-AMINOPROPYL ETHER (Amine 803)

$C_4H_9CH(C_2H_5)CH_2OC_3H_6(NH_2)$. M. W., 187.3; Sp. G., 0.8484 @ 20/20°C.; B.P., 240°C. (760 mm.); R.I., 1.4382 @ 20°C.; insoluble in water. Uses: intermediate for textile water-repellent and dispersing agents for cement, asbestos, and clay; acetate salt for flotation of silica. Available in commercial quantities. Carbide and Carbon Chemicals Corp.

GLYCINE ETHYL ESTER HYDROCHLORIDE

$C_4H_{10}ClNO_2$. M.W., 139.6. Fine, white crystals. M.P., 143.7-144.9°C. Solubility at 25°C.; practically insoluble in common organic solvents, soluble in methanol, soluble in water. Experimental quantities or available on special order. Dow Chemical Co.

3-HEPTYL "CARBITOL"* (3-Heptyl Ether of Diethylene Glycol)

$C_4H_9CH(C_2H_5)OCH_2CH_2OCH_2CH_2OH$. M.W., 204.3; Sp.G., 0.9291 @ 20/20°C.; B.P., 263.0° C. (760 mm.); F.P., sets to a glass <—70°C.; V.P., <0.01 mm. Hg @ 20°C.; coefficient of expansion, 0.00085/°C. @ 20°C.; R.I., 1.4377 @ 20°C.; viscosity, 8.5 cps. @ 20°C.; sol. in water, 1.25% by wt. @ 20°C.; sol. of water in, 15.6% by wt. @ 20°C.; odor, mild; color, water white. Chemical properties: Undergoes the normal reactions of a glycol-ether and can be esterified with dibasic acids to yield high boiling esters of interest as plasticizers. Suggested uses: As a coupling or an antifoaming agent; in brake fluid formulations. Available in research quantities Carbide and Carbon Chemicals Corp.
*Trade Mark.

3-HEPTYL "CELLOSOLVE"* (3-Heptyl Ether of Ethylene Glycol)

$C_4H_9CH(C_2H_5)OCH_2CH_2OH$. M.W., 160.2; Sp.G., 0.8855 @ 20/20°C.; B.P., 212.7°C. (760 mm.); F.P., sets to a glass <—80°C.; V.P., 0.08 mm. Hg @ 20°C.; coefficient of expansion, 0.00089/°C. @ 20°C.; viscosity, 5.7 cps. @ 20°C.; R.I., 1.4306 @ 20°C.; sol. in water, 0.60% by wt. @ 20°C.; sol. of water in, 7.1% by wt. @ 20°C.; odor, mild; color, water-white. Chemical properties: Can be esterified to yield low volatility plasticizers for synthetic resins. Suggested uses: in formulation of slow-drying inks and brushing lacquers; coupling agent for soluble oils, dry-cleaning soaps, insecticide sprays, and cutting oils; antifoaming agent. Available in research quantities. Carbide and Carbon Chemicals Corp.
*Trade Mark.

HEXACHLOROCYCLOPENTADIENE (C-56)

C_5Cl_6; M.W., 272.79; Sp.Gr., 1.715 at 15.5°/15.5°C.; R.I., 1.564 at 20°C.; B.P., 236.°C.; F.P., none; Fr.P., —2°C.; odor, sharp; color, yellow to amber. Chemical properties: highly reactive undergoing many types of reactions such as—acetal formation, Diels-Alder reactions, halogen addition, condensations with $AlCl_3$, fluorination, and hydrolysis. Suggested uses: In the synthesis of insecticides, dyes, pharmaceuticals, resins, fungicides and germicides. Availability: pilot plant quantities. Hooker Electrochemical Co.

1,1,2,2,3,3-HEXACHLORO-1,3-DIFLUOROPROPANE

$CCl_2FCCl_2CCl_2F$. M.P., 12.9°; B.P., 194.4°; d^{20}, 1.8105; n^{20}, 1.47996. A colorless liquid having a camphor-like odor. Insoluble in water but soluble in chlorinated hydrocarbons. Uses: being a fully halogenated propane and at all normal temperatures a liquid this compound is an interesting intermediate for research. Availability: At present produced only on a laboratory scale; Can easily be prepared in pilot-plant quantities. Columbia Organic Chemicals Co.

HEXYL BROMIDE, TECHNICAL

$CH_3(CH_2)_4CH_2Br$. M.W., 165. Colorless to faintly yellow oil. Sp.Gr. at 25/25°C., 1.170. B.P. at 760 mm. Hg, 155-156°C. Semi-commercial quantities. Dow Chemical Co.

α-HYDROXYDECANOIC ACID (D-1)

$CH_3C(CH_2)_5CH_2CH(CH_2)CH_2CHOHCOOH$. M.W., 188; Sap. No. 290; Acid No. 222; Hydroxyl No. 219. Alpha-Hydroxydecanoic Acid D-1, prepared by hydrolysis of nonyl aldehyde cyanohydrin, is similar to lactic acid in its chemical properties. Easily self-esterified, and product as supplied contains from 10% to 25% of the self-ester. Very viscous liquid, having a viscosity of 50 poises when 25% of self-ester is present. When heated, self-esterification continues with the formation of either the cyclic lactide or a linear polyester, depending upon the conditions used. Uses: Offers possibilities as a component of alkyd and other synthetic resins. The potassium salt of alpha-hydroxydecanoic acid is soluble in aromatic hydrocarbons and other organic solvents, and the possibility of using the lithium or heavy metal salts in lubricating greases is suggested. Has shown promise in laboratory tests as a modifier of zein Pilot plant quantities. Rohm & Haas Co.

N-HYDROXYETHYL-β-ALANINE

$HOCH_2CH_2NHCH_2CH_2COOH$. M.W., 133; M.P., 143-145°C.; physical state, light buff to white crystals; soluble in water—relatively insoluble in most organic solvents. Contains three active groups. Suggested use: chemical intermediate. Availability: experimental quantities B. F. Goodrich Chemical Co.

o-HYDROXYPROPIOPHENONE

$HOC_6H_4COC_2H_5$. M.W., 150.17; B.P., 110-115°/6 mm.; Soluble in warm alcohol, ether; insoluble in water. Chemical properties: Reactions characteristic of phenolic hydroxyl. The propionyl group can be halogenated easily. The carboxyl group reduces with greater difficulty than the p-isomer. Suggested uses: organic syntheses Research quantities. Genesee Research Corp.

p-HYDROXYPROPIOPHENONE

$HOC_6H_4COC_2H_5$. M.W., 150.17; B.P., 135-140°/11 mm.; M.P., 147-148°; Soluble in warm alcohol and ether; insoluble in water. Chemical properties: Reactions typical of phenolic hydroxyl. The p-propionyl group can be halogenated easily and the carboxyl reduced smoothly under Clemmenson conditions. Suggested uses: organic syntheses. Availability: research quantities. Genesee Research Corp.

IRON (ic) BORATE

Approx. $Fe_3(BO_4)_2 \cdot 3H_2O$; M.W., 422.6. Brown powder of variable composition. Insoluble in water, soluble in acids. Hydrolyzed by much water. Available in experimental quantities. City Chemical Corp.

ISOAMYLAMINE

$(C_5H_{11})NH_2$. M.W., (calcd.), 87.16; clear, water white liquid; odor, amine; freezing point, below —60°C.; I.B.P., 95°C.; F.B.P., 98.0°C.; vapor pressure, $\log p = -1985/T + 8.228$; flash point, 60°F. Sp.G., at 20°/20°C., 0.752; viscosity at 25°C., 0.57 centerpoise. Use: as an intermediate. Available in pilot plant quantities. Sharples Chemicals, Inc.

ISOBUTYL ANTHRANILATE

$C_4H_9CO_2C_6H_4NH_2$. Colorless to tan-colored liquid; B.P., 110°C/2mm. Stable compound of strong and pronounced odor. Useful for perfume and flavoring compounds. Fairmount Chemical Co., Inc.

ISOBUTYL CHLORIDE

$(CH_3)_2CHCH_2Cl$. M.W., 92.53. A colorless liquid of odor typical of alkyl chlorides. Insoluble in water; very soluble in alcohol and ether. F.P.,—131.3°; B.P., 68.85°; d_4^{20}, .8810; n_D^{20}, 1.3984. For introducing the Isobutyl group in organic syntheses. The material may contain 1-2% tertiary butyl chloride as impurity. Semi-commercially available. Consolidated Midland Corp.

ISO-OCTYL ALCOHOL

$C_7H_{15}CH_2OH$. M.W., 130.14; Sp.G., 0.832 @ 20°/20°C.; Vis., 12.5 cs. @ 20°C.; I.B.P., 178°C.; D.P., 188°C.; Acidity, 0.001% wt. acetic acid; Water, 0.1% wt.; Color, 5 Pt-Co; Sulfur, 5 p.p.m.; Purity, 99.0+% calculated as octyl alcohol; Carbonyl No., 0.5 mgm. KOH/gm. Chemical Properties: Mixture of isomeric primary C_8 alcohols. Reacts similarly to any other primary alcohol—with aliphatic and aromatic dibasic acids to make esters; with phosphorous acid chlorides to produce phosphoric esters; other derivatives such as mercaptans, chlorides, amines, and amides can be produced. Suggested uses: Ester-type plasticizers; lacquer and resin solvents; wetting agent intermediates; anti-foaming agents; for introducing iso-octyl group into other compounds; acid metallic sales for paint driers. Availability: Tank cars and drums. Enjay Co., Inc.

2-ISOPROPYLCYCLOHEXANOL

$C_9H_{18}O$. M.W., 142.2. A white, crystalline solid with melting point 39°C. Solubility at 25°C.: practically insoluble in water, soluble in common organic solvents. Semi-commercial quantities. Dow Chemical Co.

4-ISOPROPYLCYCLOHEXANOL

$C_9H_{18}O$. M.W., 142.2. A colorless to light yellow liquid. Boiling range at 760 mm. Hg, 5-95%, 210.2-215.5°C. Sp.Gr. at 25/25°C., 0.916. Freezing point, below —20°C. R.I., at 25°C., 1.465. Flash point, 99°C. Fire point, 101°C. Solubility at 25°C.: practically insoluble in water, completely miscible in common organic solvents. Suggested as an intermediate or solvent. Semi-commercial quantities. Dow Chemical Co.

ISOPROPYL TRICHLOROACETATE

$C_5H_7OOCCCl_3$. M.W., 205.5; mobile, light yellow liquid; M.P. below —20°C.; B.P. about 175°C.; Sp.Gr., 1.3 at 25°/25°C. Miscible with most organic solvents, immiscible with water. Suggested for use in herbicidal formulations, particularly for the control of grasses. Available in pilot plant quantities. Monsanto Chemical Co.

ISOPROPYL 2,4,5-TRICHLOROPHENOXYACETATE

$C_5H_7OOCCH_2OC_6H_2Cl_3$. M.W., 297.6; cryst. pt. about 45°C.; tan, crystalline solid. Soluble in most organic solvents, insoluble in water. Suggested for use in preparation of herbicidal formulations. Literature, 2,4,5-T Bulletin. Available in commercial quantities. Monsanto Chemical Co.

β-ISOTHIOUREIDOPROPIONIC ACID

$NH_2C(=NH)SCH_2CH_2COOH$. M.W., 148; M.P., 178-180°C.; physical state, white crystals. Soluble in water from which it crystallizes as an unstable monohydrate. Suggested use: chemical intermediate. Availability: experimental quantities. B. F. Goodrich Chemical Co.

LEAD CITRATE

$Pb_3(C_6H_5O_7)_2 \cdot 3H_2O$ M.W., 1053.78. White powder. Slightly soluble in water. Available in experimental quantities. City Chemical Corp.

LEAD CYANIDE

$Pb(CN)_2$. M.W., 259.24. White to yellowish-white powder. Insoluble in water, decomposed by acids. Available in experimental quantities. City Chemical Corp.

LITHIUM IODATE

$LiIO_3 \cdot \frac{1}{2}H_2O$. M.W., 190.87. White crystalline powder, soluble in water, insoluble in alcohol. Use: Medicinal. Available in experimental quantities. City Chemical Corp.

LITHIUM IODIDE

Desiccated, approx. LiI. M.W., 133.96. White powder. Deliquescent. Decomposed on heating in air to lithium oxide and iodine. Soluble in water. Use: Pharmaceutical photographic. Available in experimental quantities. City Chemical Corp.

LITHIUM URATE (Acid Salt)

$LiHC_5H_2O_3N_4$. M.W., 174.00. White powder. Slightly soluble in cold water, more soluble in boiling water, slightly soluble in alcohol. Available in experimental quantities. City Chemical Corp.

MAGNESIUM CHLORATE

$Mg(ClO_3)_2 \cdot 6H_2O$. M.W., 299.3. White deliquescent crystals. M.Pt. approx. 35°C. Very soluble H_2O, al. sol. alcohol. Use: Medicinal. Available in experimental quantities. City Chemical Corp.

MAGNESIUM STEARATE (#701)

Comb. MgO, 7.5-8.0%. Moisture Content, 0.5-1.0%. Bulk Average: 100-110 fl. oz./lb. White powder, M.P., 125-130°C., 100% thru 200 mesh. No odor. Insoluble in water, lower alcohols, esters, chlorinated solvents, mineral spirits, mineral oil, waxes, benzol, toluol and xylol. Use: Drugs pharmaceuticals, cosmetics, tablet manufacture. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

MAGNESIUM TUNGSTATE

$MgWO_4$. M.W., 272.3. White crystalline powder. Insoluble in water. Use: In X-ray screens. Available in experimental quantities. City Chemical Corp.

MANGANESE AMMONIUM SULFATE

$MnSO_4(NH_4)_2SO_4 \cdot 6H_2O$. M.W., 399. Pink crystals. Readily soluble in water. Available in experimental quantities. City Chemical Corp.

MANGANESE IODIDE

$MnI_2 \cdot 4H_2O$. M.W., 380.83. Red crystals, turning brown on exposure to air and light. Very soluble in water with gradual decomposition. Soluble in alcohol. Use: Medicinal. Available in experimental quantities. City Chemical Corp.

β-MERCAPTOPROPIONIC ACID

$HSCH_2CH_2COOH$. M.W., 106; B.P. @ 13-14 mm., 113.5-115.5°C.; physical state, colorless liquid; miscible with water soluble in most organic solvents. Chemical properties—reacts both as a mercaptan and as a carboxylic acid. The acid and its esters form complex salts with heavy metals. Suggested use: chemical intermediate. Availability: experimental quantities. B. F. Goodrich Chemical Co.

MERCURY (ic) SULFIDE

HgS. M.W., 232.67. Black powder. Insol. H_2O, alcohol, dil. mineral acids. Use: Medicinal, pigments. Available in experimental quantities. City Chemical Corp.

MERCURY (ous) BROMIDE

HgBr. M.W., 280.53. White powder, darkens on exposure to light. Insoluble in water and alcohol. Decomposes by HCl on alkali bromides. Use: Medicinal. Available in experimental quantities. City Chemical Corp.

m-METHOXY BENZYLCYANIDE

$m\text{-}(CH_3O)\text{-}C_6H_4\text{-}CH_2CN$. M.W. 129 White crystals. Suggested uses: Synthesis of pharmaceuticals. Availability: Pilot plant quantities. Special Chemicals Division, Winthrop-Stearns, Inc.

METHOXYCHLOR

Methoxychlor, 90% tech., oil concentrate. An insecticidal composition containing 90% 2,2-bis(*p-methoxphenyl*)-1,1,1, -trichloroethane. A white powder shipped in 100-lb- drums. Because of its low toxicity to warm-blooded animals, is indicated for use where the use of other insecticides may create a toxic hazard. E. I. du Pont de Nemours and Co. (Inc.)

2-METHOXYMETHYL-2,4-DIMETHYLPENTANEDIOL-1,5

$HOCH_2C(CH_3)(CH_3OCH_3)CH_2CH(CH_3)CH_2OH$. M.W., 176; Sp.G., 1.0165 @ 20/20°C.; R.I., 1.4621 @ 20°C.; B.P., 208°C. (100 mm.), 190°C. (50 mm.), and 153°C. (10 mm.); V.P. <0.01 @ 20°C.; F.P., sets to a glass below —40°C.; viscosity, 1132 cps. @ 20°C.; Flash P., 295°F. (Cleveland Open Cup); soluble in water in all proportions. Chemical properties: Combines the chemical characteristics of glycols and glycol ethers. Both alcohol groups are primary and are separated by five carbon atoms. Uses: Plasticizer in the milling, molding, and casting of nylon resins; coupling agent and solvent for protective coatings, hydraulic fluids, duplicating fluids, metal cleaners, textile dyes, and adhesives; intermediate for maleic and alkyd resins, plasticizers, pharmaceuticals, surface-active agents, and dyestuffs; softener and plasticizer for casein and zein. Available in commercial quantities. Carbide and Carbon Chemicals Corp.

p-METHOXYPROPIOPHENONE

$C_{10}H_{12}O_2$. M.W. 164.2. Boiling range at 760 mm. Hg., 5-95%, 274.1-280.1°C. Sp.Gr. at 25/25°C. 1.076. Freezing point, 22.1°C. R.I. at 25°C. 1.5452. Flash point, 144°C. Fire point, 150°C. Solubility at 25°C.: Practically insoluble in water, completely miscible in common organic solvents, moderately soluble in n-heptane. Experimental quantities available on special order. Dow Chemical Co.

METHYL AMYL KETONE PEROXIDE

$[(C_5H_{11})(CH_3)C(OOH)]_2O_2$. M.W., 294.38; Purity, 95.0% minimum; Active Oxygen, 15.5% minimum; Flash Point (Cleveland open cup), Over 120°F. A water-white liquid with a specific gravity at 25°C. of 1.0. Soluble in oxygenated organic solvents, slightly soluble in petroleum solvents, insoluble in water. Can be considered for investigations requiring an active, essentially pure, liquid type organic peroxide. Useful as a catalyst in peroxide initiated polymerization and other reactions. In the polymerization of vinyl or polyester type resins, will function as an efficient catalyst at temperatures ranging from 40° to 85°C. Available in pilot plant quantities, samples on request. Lucidol Division, Novadel-Agene Corp.

METHYL BENZYL ALCOHOL (Mixed Isomers)

$CH_3C_6H_4CH_2OH$. M.W., 122.16; Sp.G., 1.025 @ 25°/4°C.; R.I., 1.5360 @ 25°C.; B.P., 111-114°C. (15 mm.); vapor pressure @ 100°C., 9.5 mm.; M.P., about 30°C. (supercools readily); viscosity, 6.9 cp. @ 30°C.; flash point 232°F. (111°C.); fire point, 243°F. (117°C.); solubility in water, 1.6% @ 30°C.; solubility, water in, 5.6% @ 30°C.; completely miscible with most organic solvents; odor, mild aromatic; color, less than 25 APHA Pt-Co. Chemical Properties: Undergoes the typical reactions of primary aliphatic alcohols in addition to other reactions unique to benzyl alcohol and other aromatic alcohols. Undergoes Friedel-Crafts condensations to introduce the benzyl group into other compounds. The CH_2OH group can be oxidized, dehydrogenated and hydrogenated. The aromatic nucleus can also be sulfonated, nitrated, halogenated, etc., with due regard for the activity of the substituent groups. Suggested uses: In the synthesis of plasticizers, perfume fixatives, pharmaceuticals, flavorings, insecticides, polyesters, and other organic chemicals. Direct use as a foaming and frothing agent, emulsion stabilizer, local anaesthetic and antiseptic, and solvent in the cosmetics, ink and lacquer industries. Availability: Pilot-plant quantities for experimental purposes. Ohio-Apex, Inc.

METHYL BENZYL CHLORIDE (Mixed Isomers)

$CH_3C_6H_4CH_2Cl$. M.W., 140.63; Sp.G., 1.072 @ 25°/4°C.; R.I., 1.5357 @ 25°C.; B.P., 84-87°C. (15 mm.), about 200°C. with decomposition (760 mm.); insol. in water; completely miscible with gasoline, benzene, ethyl alcohol and isopropyl ether; freezing point, about —25°C.; viscosity, 1.8 cp. @ 20°C.; odor, penetrating and pungent, lachrymatory; color, water-white to pale yellow. Chemical properties: Undergoes the reactions typical of benzyl chloride and other aralkyl chlorides. Ease of replacement of chlorine atom is greater than for benzyl chloride. The chloromethyl group can be further halogenated, oxidized and reduced. The aromatic nucleus can be sulfonated, nitrated, halogenated, etc. with due regard for the activity of the substituent groups. Direct use as an extractant, degreasing solvent, fumigant, polymerization regulator and lachrymator. Availability: Pilot-plant quantities for experimental purposes. Also available as a crude reaction product, containing 80-85% methyl benzyl chloride. Ohio-Apex, Inc.

2-METHYLTETRAHYDROFURAN (Tetrahydromethylfuran)

$C_4H_7O(CH_3)$. Colorless, mobile liquid; M.W., 86.13; B.P., 80° C. (176° F.); flash pt. —12° C. (10.4° F.). Miscible with most organic solvents. Is an excellent solvent for rosin, natural gums, ethyl cellulose and, at elevated temperatures, vinyl chloride-acetate copolymers. Reacts by substitution and fissure of the ring. E. I. du Pont de Nemours & Co. (Inc.)

METHYLOL DIMETHYL HYDANTOIN (MDMH)

$C_5H_7O_2N_2(CH_2OH)$. White, crystalline solid; an odorless donor of formaldehyde. M.W., 158.156; M.P., 99-103° C. (210-217° F.); 18.98% combined formaldehyde. Soluble in water, methanol, and acetone. Slightly soluble in ethyl acetate; insoluble in hydrocarbons, trichlorethylene, carbon tetrachloride, and diethyl ether. Reacts as a substituted hydantoin or as an odorless formaldehyde donor. E. I. du Pont de Nemours & Co. (Inc.)

NICKEL CHROMATE

Reddish-brown powder of variable composition.

m-NITROBENZOTRIFLUORIDE

$NO_2C_6H_4CF_3$; M.W., 191.11; Sp.G., 1.437 at 15.5°/15.5°C; R.I., 1.472 at 20°C.; B.P., 203°C; Flash P., 101°C; F.P., —5.0°C; odor, aromatic; color, pale straw. Chemical properties: The CF_3 group is stable to further chemical reaction. The NO_2 group may be reduced in alkaline media. Subject to further substitution in the meta position. Suggested uses: Intermediate for dyestuffs and other fluorine containing compounds. Availability: Pilot-plant quantities. Hooker Electrochemical Co.

3-NITRO-4-CHLOROBENZOTRIFLUORIDE

$C_6H_2CF_3[3\text{-}NO_2,4\text{-}Cl]$; M.W., 225.56; Sp.G., 1.542 at 15.5°/15.5°C; R.I., 1.491 at 20°C; B.P., 222°C; Flash P., 122°C; F.P., —7.5°C; odor, aromatic; color, yellow. Chemical properties: Subject to further ring substitution in number 5 position. NO_2 group may be reduced in alkaline media. The Cl atom is very stable, hydrolysis results in attack on the CF_3 group. Suggested uses: In the synthesis of dyes, pharmaceuticals and other fluorine containing organic chemicals. Availability: Pilot-plant quantities. Hooker Electrochemical Co.

NONAMETHYLENE DIBROMIDE

$C_9H_{18}Br_2$. M.W., 285.97. An oily liquid boiling over the range 128-130°/2mm. Valuable intermediate for the preparation of pharmaceuticals. Semi-commercially available. Consolidated Midland Corp.

NONANOIC ACID (D-1)

$CH_3C(CH_3)_2CH_2CH(CH_3)CH_2COOH$. M.W. 158; Sp.gr. (25°C) 0.888; ref. index (20°C) 1.4288; B.P. 231°C/760 mm, 133°C/20 mm. May be expected to undergo the characteristic reactions of the fatty acids. The salts with heavy metals may be useful as paint driers, and as gelling agents for hydrocarbons and other organic solvents for use in lubricating greases, coatings, etc. The copper salt may be of interest as a mildewproofing agent. The vinyl and allyl esters are interesting monomers. Esters may be useful as plasticizers and synthetic lubricants, and the acid can be used for the modification of non-drying alkyd resins and the preparation of cellulose acetate-nonanoate. Other derivatives may find application in the fields of surface-active agents, oil additives, and pharmaceuticals. Availability: Pilot-plant quantities. Rohm & Haas Co.

NONYL ALDEHYDE CYANOHYDRIN (D-1)

$CH_3C(CH_3)_2CH_2CH(CH_3)CH_2CHOHCN$. M. W. 169; Visc. (25°C) 22CP; Sp.gr. (25°C) 0.8976; Purity 93% min.; ref. index (25°C) 1.4390; HCN content 0.2% min. An interesting intermediate for conversion to hydroxy amides, hydroxy esters, amino acids, diamines, an unsaturated nitrile and acid, and various heterocyclic compounds such as octylhydantoin. These derivatives may have applications as plasticizers, pharmaceuticals, dye intermediates, rubber chemicals, oil additives, synthetic resins, corrosion inhibitors, photographic chemicals, and pesticides. Cannot be distilled because of decomposition to nonyl aldehyde and hydrogen cyanide. Stable at moderate temperatures as long as a pH of less than 5 is maintained. Availability: Pilot-plant quantities. Rohm & Haas Co.

NONYLAMINE (D-1)

$CH_3C(CH_3)_2CH_2CH(CH_3)CH_2CH_2NH_2$ M.W. 142; ref. index (20°C) 1.4323; sp.gr. (25°C) 0.785; surface tension 0.1% in distilled water 39.0 dynes, 0.1% in 1% HCl 45.6 dynes; B.P. 178°C/760 mm. Undergoes the typical reactions of a primary amine. Useful as an intermediate for introducing an oil-soluble amino group in the synthesis of detergents, oil additives, corrosion inhibitors, and similar products. The salts with higher acids are of interest where an oil-soluble, water-soluble surface-active agent is required. Availability: Pilot-plant quantities. Rohm & Haas Co.

NONYL "CARBITOL"*

(2,6-Dimethyl-4-Heptyl Ether of Diethylene Glycol)

$(CH_3)_2CHCH_2CH(OC_2H_4OC_2H_4OH)CH_2CH(CH_3)_2$ M.W., 232.3; Sp.G., 0.920 @ 20°C.; B.P., 274°C. (760 mm.); V.P., <0.1 mm. Hg @ 20°C.; coefficient of expansion, 0.00082/°C. @ 20°C.; R.I., 1.439 @ 20°C.; viscosity, 13.4 cps. @ 20°C.; sol. in water, 0.2% by wt. @ 20°C.; sol. of water in 5.9% by wt. @ 20°C.; odor, mild; color, water-white. Chemical properties: Enters reactions typical of primary alcohols. Suggested uses: As a coupling agent or an antifoaming agent; in hydraulic fluid formulations. Available in research quantities. Carbide and Carbon Chemicals Corp.
*Trade-Mark.

NONYL "CELLOSOLVE"*

(2,6-Dimethyl-4-Heptyl Ether of Ethylene

$(CH_3)_2CHCH_2CH(OC_2H_4OH)CH_2CH(CH_3)_2$ M.W., 188.2; Sp.G., 0.874 @ 20/20°C.; B.P., 226°C. (760 mm.); V.P. <0.1 mm. Hg @ 20° C; coefficient of expansion, 0.00085/°C. @ 20° C.; R.I., 1.432 @ 20°C.; viscosity, 9.3 cps. @ 20°C.; sol. in water, 0.2% by wt. @ 20°C.; sol. of water in, 3.5% by wt. @ 20°C.; odor, mild; color, water-white. Chemical properties: Can be esterified with organic acids such as adipic to yield esters suitable for plasticizers. Suggested uses: Coupling agent, antifoaming agent, and in formulation of slow-drying inks and brushing lacquers. Available in research quantities. Carbide and Carbon Chemicals Corp.
*Trade-Mark.

OCTADECENYL ALDEHYDE D-2

(2,2,4,8,10,10-Hexamethyl-5-formyl-5-undecylene)

$(CH_3)_3CCH_2CH(CH_3)C(CHO):CHCH_2CH(CH_3)CH_2C(CH_3)_3$. M.W. 266; B.P. 110°C/1.7 mm, 167°C/20 mm; ref. index (25°C) 1.4620; sp.gr. (25°C) 0.840-0.854; % aldehyde 9.2-11.2 (theory = 10.9). Prepared by aldol condensation of nonyl aldehyde. May be converted to octadecyl aldehyde, octadecylamine, and other derivatives which may be useful as surface-active agents, rubber chemicals, synthetic drying oils, pesticides, and oil additives. Availability: Pilot-plant quantities. Rohm & Haas Co.

OCTADECYL ALCOHOL D-2

(2,2,4,8,10,10-Hexamethyl-5-Undecylcarbinol)

$(CH_3)_3CCH_2CH(CH_3)CH(CH_2OH)C_6H_4CH(CH_3)CH_2C(CH_3)_3$. M.W. 270; B.P. 122°C/1 mm, 177°C/20 mm; ref. index (25°C) 1.4517; sp. gr. (25°C) 0.840. A liquid. It can be expected to take part in typical reactions of a primary alcohol. Its most important derivatives are the sulfate, which has good surface-active properties, and the esters, which offer possibilities as plasticizers, synthetic lubricants ,and solvents. Other derivatives of the alcohol may find application in oil additives and allied fields. The alcohol itself may be of interest as a lubricant for metal cutting and plastics molding, as a softener and lubricant for textiles, and as anti-foaming agent, plasticizer, and solvent. Availability: Pilot-plant quantities. Rohm & Haas Co.

OCTYL BROMIDE, TECHNICAL

$CH_3(CH_2)_7Br$. M.W., 193. Colorless to faintly yellow oil. Sp.Gr. at 25/25°C., 1.107. B.P. at 760 mm. Hg, 200-201°C. Semi-commercial quantities. Dow Chemical Co.

OLEIC ACID, LOW LINOLEIC

(Emersol 233 LL Elaine)

$C_{17}H_{33}COOH$, Oleic Acid; M.W., 282; Free Fatty Acid (as Oleic), 99.6%, Titre, 9.0°C.; Iodine Value, 90; Linoleic and other polyunsaturates, less than 4.0%; monounsaturated acids, more than 90%; color (Lovibond 5¼" column), 5.0 Y/0.5R; Mackey test, over 7 hrs.; sol. in most organic solvents; insol. in water; bland odor. Chemical properties: Undergoes reactions typical of monounsaturated, monocarboxylic fatty acid, including acid reactions with bases, amines, alcohols and double bond reactions such as halogenation, sulfonation, etc. Suggested for use wherever color, odor and heat resistance, oxidation resistance and high purity are desired. Availability: Tank cars, drums. Emery Industries, Inc.

OLEYL ALCOHOL N. F.

A grade of normal primary fatty alcohol which meets the specifications for oleyl alcohol as given by the National Formulary. Available in limited commercial quantities. E. I. du Pont de Nemours & Co. (Inc.)

PARAFORMALDEHYDE (Flake Form)

$(HCHO)_n$. Min. Assay 91% HCHO with the remainder H_2O; Bulk Density 0.65, white, pulverable, flakes which pass ½ inch screen. Ash content, acidity, iron are held to formalin specifications. No methanol inhibitors or buffering salts present. Easily depolymerizes to furnish monomeric formaldehyde. Uses: Resin raw material; as a controlled source of formaldehyde in the manufacture of thermosetting resins to give increased reactor capacity, easier handling, completely uninhibited formalin, and minimized water removable problems. Other uses as an organic chemical intermediate, as a mold preventive, deodorant, and fumigant, as a starch fermentation preventive. Available in commercial quantities. Celanese Corp.

PENTAERYTHRITOL DIACETAL

$C_9H_{16}O_4$. M.W., 188.22; white crystalline solid; M.P., 41°C.; B.P., 216°C.; soluble in water, hydrocarbons, ethers, alcohols. Chemical properties: stable to alkalies; hydrolyzes slowly with mineral acids. Suggested uses: as a solvent and plasticizer. Available in pilot plant quantities. Heyden Chemical Corp.

PENTAERYTHRITOL DI-n-BUTYRAL

$C_{13}H_{24}O_4$. M.W., 245.32; M.P., 55°C.; B.P., 289°C.; soluble in alcohols, ketones, hydrocarbons, esters, and chlorinated compounds. Suggested uses: as a solvent and plasticizer. Available in pilot-plant quantities. Heyden Chemical Corp.

PENTAERYTHRITOL DIFORMAL

$C_7H_{12}O_4$. M.W., 160.17, white crystalline solid; M. P., 50°C.; soluble in water, hydrocarbons, ethers, alcohols. Chemical properties: stable to alkalies; hydrolyzes slowly with mineral acids. Suggested uses: as a solvent and plasticizer. Available in pilot plant quantities. Heyden Chemical Corp.

PENTAERYTHRITOL DIPROPIONAL

$C_{11}H_{20}O_4$. M.W., 216.27; M.P., —22°C.; B.P., 258-9°C.; Sp.Gr., 25/25°—1.061; soluble in alcohols, ketones, esters, hydrocarbons, chlorinated compounds; insoluble in water. Suggested uses: as a solvent and plasticizer. Available in pilot plant quantities. Heyden Chemical Corp.

1,1,2,3,3-PENTAFLUORO-1,2,3-TRICHLOROPROPANE

$CF_2ClCFCl_2CF_2Cl$. M.W., 237.41; R.I., 1.351 @ 20°C.; B.P., 73°C.; insol. in water; odor, sweetish; color, water white. Suggested uses: As an intermediate in the preparation of highly fluorinated organic chemicals; as a stable, inert medium. Availability: Research quantities Halogen Chemicals, Inc.

PENTANOL-3

(Diethyl Carbinol)

$C_2H_5CHOHC_2H_5$. M.W., 88.2; Sp.G., 0.815 @ 25/4°C.; B.P., 115.6°C.; R.I., 1.4077 @ 25°C.; V.P., 12 mm. Hg @ 30°C.; viscosity, 4.12 cps. @ 25°C. Chemical properties: undergoes typical reactions of a secondary alcohol. Uses: In the synthesis of compounds where its specific molecular structure is required; in the manufacture of sedatives, hypnotics, and anti-convulsants, and of flotation agents for non-ferrous ores. Available in commercial quantities. Carbide and Carbon Chemicals Corp.

PHENOTHIAZINE-5-OXIDE

$C_{12}H_9NOS$. M.W., 215.3. Light cream crystals. Solubility at 25°C.: practically insoluble in common organic solvents, slightly soluble in methanol, practically insoluble in water. Experimental quantities or available on special order. Dow Chemical Co.

α-PHENOXYPROPIONIC ACID

$C_6H_5OCH(CH_3)COOH$. M.W., 166.2. Fine, light brown crystals. M.P., 115.5-117.4°C. Solubility at 25°C.: practically insoluble in n-heptane, slightly soluble in benzene, carbon tetrachloride and water, soluble in acetone, ether, and methanol. Semi-commercial quantities. Dow Chemical Co.

PHYTOSTEROLS (from soybean oil)

Mixture of Stigmasterol, $C_{29}H_{47}OH$; beta- and gamma-sitosterol, $C_{29}H_{49}OH$; dihydrositosterol, $C_{29}H_{51}OH$; campersterol, $C_{28}H_{47}OH$; and other related compounds not yet characterized; M.P., 135°-138°C.; nearly insoluble in water; sol. in benzene; chloroform, acetone, ethyl ether, hot ethyl alcohol, fats and oils; white, finely divided needles and plates; bromine no., approx. 500 gm/kilo. Suggested uses: Commercial processes which would utilize the ability of sterols to stabilize oil-in-water and water-in-oil emulsions and to serve as raw materials for the synthesis of surface-active agents, pharmaceuticals, and other chemical products. Commercially available in tonnage quantities. Eastman Kodak Co.

POTASSIUM BINIODATE

$KH(IO_3)_2$. M.Wt., 389.94. White crystals. Soluble 1.33 grams in 100 of water at 15°. Use: Reagent. Available in experimental quantities. City Chemical Corp.

POTASSIUM DICYANOGUANIDINE

$NCN{=}C(NH_2)N(K)CN$. M.W., 147.2; colorless, odorless, crystalline solid; M.P., 265°C. (dec.); R.I., n_D^{25} (saturated aqueous solution), 1.3583; soluble in water, nearly insoluble in most organic solvents; the salt is essentially neutral and the free acid is a strong acid comparable to HCl. Chemical properties: It is converted to substituted melamines or isomelamines, depending upon the conditions of reaction, by the action of amines; ammeline is formed by treatment with HCl. Suggested use: Intermediate for organic syntheses. Availability: Trial-lot quantities for experiment. American Cyanamid Co.

POTASSIUM TELLURITE

K_2TeO_3. M.Wt., 253.80. Fine white crystals, deliquescent. Readily soluble in water. Use: Detection of living pathogenic bacteria in sera and vaccines. Available in experimental quantity. City Chemical Corp.

POTASSIUM THIOSULFATE

$K_2S_2O_3$. M.W., 190.31. K = 41%. White, granular powder; soluble in water; insoluble in alcohol. Used as brightening agent in silver plating. Available in commercial quantities. Chemo Puro Mfg. Corp.

POTASSIUM TRIPOLYPHOSPHATE

$K_5P_3O_{10}$. M.W., 448.4; pH of 1% solution 10.0. A white crystalline powder, very soluble in water. An excellent sequester for calcium, magnesium and other metallic ions. Suggested uses: Water softening agent, detergent builder, for incorporation in textile oils and soaps where excellent sequestering and high solubility are required. Availability: Semi-commercial quantities. Monsanto Chemical Co.

POTASSIUM ZINC SULFATE

$K_2Zn(SO_4)_2{\cdot}6H_2O$. M.W., 443.8. White crystals. Readily soluble in water. Available in experimental quantities. City Chemical Corp.

PROPYLENE CHLOROBROMIDE

$CH_3CHBrCH_2Cl$ with $CH_3CHClCH_2Br$.

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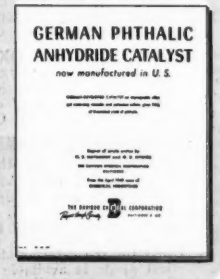

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M.W., 157.5. Colorless neutral oil. Sp.Gr. at 25/25°C., 1.545. B.P. at 760 mm. Hg, 118°C. Semi-commercial quantities. Dow Chemical Co.

SILVER BENZOATE

$AgC_7H_5O_2$. M.W., 228.92. White powder. Decomposed by light. Slightly soluble in cold water, more in hot, very slightly soluble in alcohol. Available in experimental quantities. City Chemical Corp.

SILVER CHROMATE

Ag_2CrO_4. M.W., 331.77. Reddish brown powder. Insoluble in water, soluble in nitric acid and in NH_4OH. Available in experimental quantities. City Chemical Corp.

SILVER PERMANGANATE

$AgMnO_4$. M.W., 226.81. Violet crystalline powder. Soluble in 100 parts of water. Decomposed by alcohol. Use: Medicinal. Available in experimental quantities. City Chemical Corp.

SILVER PHOSPHATE

Ag_3PO_4. M.W., 418.66. Yellow powder, darkened by light. Insoluble in water. Soluble in dilHNO_3, in NH_4OH, alkali cyanides and thiosulfates. Use: Photography, physiological chemistry. Available in experimental quantities. City Chemical Corp.

SILVER SELENATE

Ag_2SeO_4. M.W., 360. White or pale yellow powder. Insoluble in water. Available in experimental quantities. City Chemical Corp.

SODIUM AMIDE
(Sodamide)

$NaNH_2$. M.W., 39. Color, gray, free flowing powder. Chemical properties: Condensing agent in the Claisen condensation, alkylations, acylations, ring closures, aminations, etc. Suggested uses: In the manufacture of pharmaceuticals, perfume intermediates, fine chemicals and general organic synthesis. Availability: Commercial quantities. The Farchan Research Laboratories.

SODIUM BOROHYDRIDE

$NaBH_4$. M.W., 47.8. White to brownish white microcrystalline powder and lumps. Melts at dull red heat in vacuo with decomposition. Density, 1.07 g/cc. Stable in air to 300°C. May be handled in air according to safe practice for inflammable hygroscopic powders (comparable to calcium carbide). Reacts inappreciably with cold water in which it is moderately soluble. Reacts slowly with water at room temperature, rapidly at 50°C. or in the presence of acids or certain metal salts. Chemical reactions: Hydrolyzes to yield hydrogen; convenient source of diborane; synthesis of other borohydrides. In aqueous solution it reduces to the next lower stable valence ions of cerium IV, chromium VI, iron III, mercury II and I, and thallium III and I. Many other salts are reduced or precipitated as borides or mixtures. Iron may be determined analytically by reduction with $NaBH_4$. In general sodium borohydride reduces the carbonyl group of aldehydes, ketones, and acid halides but does not reduce the carbonyl group of acids, esters, or anhydrides. It does not generally reduce olefinic double bonds, nitriles, alkyl or aryl halides. Reactions may be carried out in aqueous, methanolic, or dioxane, etc., solution under a variety of conditions. The stability of the reactant and the intermediate borate $(RO)_4BNa$ are important factors. Sodium borohydride is principally useful under conditions using aqueous, alcoholic, or amine solutions where lithium aluminum hydride is not applicable. Metal Hydrides, Inc.

SODIUM BOROPHOSPHATE

$Na_3PO_4.NaBO_2.18H_2O$. A colorless, crystalline, slightly efflorescent solid. M.P., 68° C. Solubility in water, 12.95 parts per hundred at 25° C., 20.8 parts per hundred at 35° C. Refractive indices, Ng 1.453, Nm 1.451, Np 1.445. pH of a 1% solution, 11.5; of a 0.5% solution, 11.3. Contains 12.5-12.7% P_2O_5, 6.25-6.3% B_2O_3. Suggested uses: Detergent formulation, metal cleaner. Victor Chemical Works.

SODIUM BUTYRATE

$Na\ C_4H_7O_2$. M.W., 110.06; white powder, soluble in water. Uses: fungus preventive; buffer salt. Amend Drug & Chemical Co.

SODIUM CELLULOSE SULPHATE

A light brown granular powder; completely soluble in water. At 2% concentration a substantially water-white solution is formed with a viscosity ranging from 200 to 600 centipoises, and a pH of from 7 to 9. Both higher and lower viscosity materials can be prepared if desired. Heating a 2% solution for as long as 18 hours at 75° C. has little effect on either the pH or the viscosity. Promotes detergency by preventing soil redeposition, conditions the viscosity of well drilling mud, provides a grease and ink resistant finish for various papers, and is useful as a sizing and finishing material in the textile industry. Available in experimental quantities. Tennessee Eastman Corp.

SODIUM DEHYDROACETATE
(DHA*)

$C_8H_7NaO_4 \cdot H_2O$. M.W., 208.1. A white powder. M.P., 109-111°C. (sublimes). Solubility at 25°C.; practically insoluble in benzene, carbon tetrachloride, ether, n-heptane and olive oil; slightly soluble in acetone and 95% ethanol; moderately soluble in glycerine, methanol, propylene glycol and water. A food stabilizer which is colorless, odorless and tasteless in all concentrations suitable for use. Inhibits or kills bacteria, fungi and yeasts that are commonly encountered in cosmetics, food and beverage processing. Semi-commercial quantities. Dow Chemical Co. * Trademark.

SODIUM DEHYDROCHOLATE

$C_{23}H_{35}O_5COONa$. M.W., 424.50. White powder. Soluble in water, slightly soluble in alcohol. Use: Medicinal. Available in experimental quantities. City Chemical Corp.

SODIUM GLYCOLATE

$CH_2OH\ COONa$. M.W., 98.03. White powder. Soluble in water. Available in experimental quantities. City Chemical Corp.

SODIUM 2-HYDROXYETHANESULFONATE
(Sodium Isethionate)

$CH_2OHCH_2SO_3Na$. Assay, 95-98%; M.P., 197-200° C.; soluble in water and in hot ethanol (95%). Suggested uses: As a chemical intermediate in the synthesis of detergents and pharmaceuticals. Available in experimental quantities. Wyandotte Chemicals Corp.

SODIUM ISETHIONATE

$HOC_2H_4SO_3Na$. M.W., 148.1; White crystal line solid; M.P., 189-192° C.; soluble in water; generally insoluble in organic solvents; suggested uses, as an intermediate for synthesis. Availability, experimental quantities. Monsanto Chemical Co.

SODIUM 2-HYDROXYPROPANESULFONATE

$CH_3CH_2OHCH_2SO_3Na$. Assay, 95-98%; M.P., 222-225° C.; soluble in water and in hot ethanol (95%). Suggested uses: As a chemical intermediate in the synthesis of detergents and pharmaceuticals. Available in experimental quantities. Wyandotte Chemicals Corp.

SODIUM MALONATE

$Na_2C_3H_2O_4$. M.W., 148. Large white crystals. Readily soluble in water, insoluble in alcohol. Available in experimental quantities. City Chemical Corp.

SODIUM METAPHOSPHATE
(Cyclophos)

$(NaPO_3)_4 \cdot 4H_2O$. M.W., 480. A hydrated crystalline, cyclic sodium metaphosphate. It is water soluble, a 1% solution having a pH of 6.1 to 6.2. Chemical properties: Hydrolyzes very slowly in aqueous solutions forming one mole each of ortho- and triphosphate. Coagulates albumin, precipitates Pb^{++} and Sn^{++++} quickly and Ba^{++} slowly, but does not precipitate Ag^{+}, Zn^{++}, Cu^{++}, or Hg^{++}. Suggested uses: Deflocculating agent for oil well drilling muds and clays, where stability above 70°C. is desired. Availability: Experimental quantities. Victor Chemical Works.

SODIUM THIOANTIMONATE

$Na_3SbS_4.9H_2O$. M.W., 481.13. Also called sodium sulfantimonate and Schlippe's salt. Yellow to green crystals, strongly alkaline. Readily soluble in water, insoluble in alcohol. Availabe in experimental quantities. City Chemical Corp.

1,1,1,2-TETRACHLOROETHANE

$CH_2Cl\text{-}CCl_3$. D., 1.588; B.P., 129-131°. A colorless liquid having characteristic chlorinated hydrocarbon odor insoluble in water but soluble in alcohol and ether. Uses: Limited to research involving substitution reactions due to laboratory-scale manufacture. Columbia Organics Chemical Co.

TETRA (DIMETHYLAMIDO) PYROPHOSPHATE
(Octamethyl Pyrophosphoramide)

$[(CH_3)_2N]_2P_2O_3[N(CH_3)_2]_2$. M.W., 286. Water white to yellowish brown. Purity approximately 95-98%. Sp.G., 1.1368 at 25° C. B.P., 142° C. at 2 mm. Slightly sweet odor. Miscible in water. Soluble in most common organic solvents. Quite stable in water and alkali solutions. When placed in soil or on plants it is taken up by plant's system, thus rendering the whole plant toxic to insects. Suggested use: Systemic insecticide for control of aphids, mites, grape phylloxera and others. Availability: Limited research quantities. Victor Chemical Works.

TETRAETHYLAMMONIUM HEXAFLUOPHOSPHATE

$(C_2H_5)_4NPF_6$. M.W., 275.23; M.P., 255° C. Solubilities at room temperature in 100 g. of respective solvents: water, 0.9 g.; ethanol, 0.1 g. (fairly soluble hot); acetone, 24.7 g.; insoluble in carbon tetrachloride, ligroin, diethyl ether. May be of interest for comparison with the corresponding chloride in effects on autonomic nervous system. May also be useful in light metal soldering fluxes. Available in experimental quantities. Ozark-Mahoning Co.

1,1,1,2-TETRAFLUORO-3,3-DICHLOROPROPENE

$CCl_2{:}CFCF_3$. M.W., 182.95; D., 1.5389 @ 20°/4° C.; R.I., 1.3504 @ 20° C.; B.P., 46.4° C.; insol. in water; odor, sweetish; color, water white. Suggested uses: In the synthesis of fluoro-organics such as fluoroplastics, refrigerants, dielectric fluids. Availability: Research quantities. Halogen Chemicals, Inc.

1,1,3,3-TETRAFLUORO-1,2,2,3-TETRACHLOROPROPANE

$CF_2ClCCl_2CF_2Cl$. M.W., 253.87; D., 1.7199 @ 20°/4° C.; R.I., 1.3958 @ 20° C.; B.P., 112° C.; insol. in water; odor, sweetish; color, water white. Suggested uses: In the synthesis of stable organic fluorine compounds. Availability: Research quantities. Halogen Chemicals, Inc.

TETRAHYDROPHTHALIMIDE
(4-Cyclohexene-1,2-dicarbonoximide)

$C_6H_8(CO)_2NH$. M.W., 151.1 M.P., 134-5°. Color, white crystals. Soluble in most organic solvents. Chemical properties: The double bond is readily hydrogenated and undergoes the other addition reactions typical of this structure, while the imide forms *N*-alkyl derivatives. Suggested uses: In the manufacture of insecticides, insect repellents, pharmaceuticals, dyestuffs and general organic synthesis. Availability: Pilot-plant quantities. The Farchan Research Laboratories.

TETRA-ISOPROPYL PYROPHOSPHATE

$(i\text{-}C_3H_7O)_2P_2O_3(O\text{-}i\text{-}C_3H_7)_2$. M.W., 346. B.P., 92-95° C. at 0.01-0.02 mm. M.P., 14-15° C. Refractive index N_D 1.4170. Sp.G., 1.0854 at 25°. Water white to light straw colored liquid. Soluble in common organic solvents and water. Technical material approximately 98-99% pure. Hydrolyzes very slowly in water. Suggested uses: For the formulation of sprays or dust base insecticidal mixtures for the control of various insect pests. Stability and residual activity is intermediate to TEPP and Parathion. Availability: Limited research quantities. Victor Chemical Works.

THALAM
(Butylamine Salt of N-Butyl Phthalamic Acid)

$C_6H_4(COOH.NH_3C_4H_9)(CONHC_4H_9)$. M.W., 294; white waxy solid; M.P., 84-92° C. Suggested for use as an accelerator activator in the curing of rubber articles. Availability, semi-commercial quantities. Monsanto Chemical Co.

THALLIUM (ous) BROMIDE

$TlBr$. M.W., 284.3. Pale yellow crystalline powder. Very slightly soluble in water. Available for experimental quantities. City Chemical Corp.

THALLIUM (ous) CARBONATE

Tl_2CO_3. M.W., 468.8. White to cream colored powder or crystals. Soluble in water, insoluble in alcohol. Use: Mfgr. Imitation diamonds. Available in experimental quantities. City Chemical Corp.

THALLIUM (ic) HYDROXIDE

$Tl(OH)_3$. M.W., 255.4. Brown to black powder. Insoluble in water and alkalies. Soluble in acids. Available in experimental quantities. City Chemical Corp.

THALLIUM (ous) MALONATE

$CH_2(COOTl)_2$. M.W., 510.8. White crystalline powder. Very soluble in water. Use: Determining specific gravities of heavy minerals. Available in experimental quantities. City Chemical Corp.

THALLIUM (ous) NITRATE

$TlNO_3$. M.W., 266.4. White crystalline solid. Soluble in water. Insoluble in alcohol. Use: Reagent in analytical chemistry in green signal flares, pigments, photography. Available in experimental quantities. City Chemical Corp.

THALLIUM (ous) OXIDE

Tl_2O_3. M.W., 456.78. Black or dark brown. M.P., 759. Insoluble in water, decomposed by HCl with evolution of chlorine. Available in experimental quantities. City Chemical Corp.

THIO-MICHLER'S KETONE
(Tetramethyldiaminothiobenzophenone)

$(CH_3)_2N\ C_6H_4CS\ C_6H_4N(CH_3)_2$. Purple, crystalline flakes, sparingly soluble in water and alcohol. M.P., 202° C. Suggested use: as a reagent for the cyanide groups. It forms colored complexes with heavy metal salts, and can be used for the determination of mercury. A practical grade is available in experimental quantities. Fairmount Chemical Co., Inc.

THIOPHOSGENE
(Thiocarbonyl chloride)

$CSCl_2$. M.W., 115.0, Sp.G., 1.509 @ 15/4° C., B.P., 73.5° C. (72-76° C. quality supplied). Red liquid, soluble in organic solvents having no active hydrogen (reacts with active hydrogen compounds); insoluble in water. Chemical prop-

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Baker's Lead Acetate Technical is available in five physical forms: crystal, small crystal, coarse powder, granular and powder. Sizes of large crystals are: 1" to 1½" on the average; small crystals are ½" and less. Baker's Lead Acetate is colorless and free-flowing. It is exceedingly low in **Cl, NO_3, Fe and Cu.**

LEAD PEROXIDE TECHNICAL assay 88½ to 90½%

Baker's Lead Peroxide Technical is a fine powder and very uniform in texture. The color is also exceptionally uniform being a light chocolate shade. Where a low water soluble material is required this product has wide appeal.

Samples and prices on any one or all three Lead Salts will be gladly forwarded upon request. Address your letter direct to J. T. BAKER CHEMICAL CO., *Executive Offices*, Phillipsburg, N. J.

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erties: Undergoes reactions like phosgene—Friedel-Crafts to give thioketones; with amines to give thiocarbamic compounds and substituted thioureas; with alcohols to give thiochlorocarbonates and thiocarbonates. Hydrolyzes slowly; oxidizes slowly in air. Suggested uses: Organic synthesis—dyes, insecticides, pharmaceuticals (thiobarbiturates, etc.), perfume ingredients—and rubber modification. Research quantities available. Rapter Laboratories.

THIOPHOSPHORYL CHLORIDE

$PSCl_3$. M.W., 169.45; clear liquid boiling at 124.0° C. at 760 mm. Sp.G. 1.6325 at 25° C./25° C. Suggested for use as an intermediate in synthesis. Availability, commercial quantities. Monsanto Chemical Co.

TITANIUM METAL

A grade of normal primary fatty alcohol Structural metal and alloy ingredient. Forms: Sponge metal and ingots of 10 and 100 pounds. E. I. du Pont de Nemours & Co. (Inc.)

TIN (ic) BROMIDE

$SnBr_4$. M.W., 438.4. Colorless crystals or pale yellow liquor. M.P., 30°C., B.P., 203°. Fumes in air. Readily soluble in water with evolution of heat. Soluble in alcohol. Available in experimental quantities. City Chemical Corp.

TRIBROMOACETIC ACID

CBr_3COOH. M.P., 123-126° C. In synthesis of organic chemicals. Semi-commercially available. Consolidated Midland Corp.

1,2,3-TRIBROMOBUTANE

$BrCH_2CHBrCHBrCH_3$. M.W., 295. Colorless to faintly yellow oil. Sp.Gr. at 25/25° C., 2.211. B.P. at 10 mm. Hg, 93-94° C.; at 760 mm. Hg, 224-225° C. Semi-commercial quantities. Dow Chemical Co.

TRIBUTYL ACONITATE

$C_{15}H_{20}O_6$. M.W., 342.4; colorless liquid; B.P. @ 1 mm Hg., 169-70° C.; Refractive Index @ 24° C., 1.4543; Sp.G. @ 20° C., 1.018. Evaporation rate ($gm/cm^2/hr$) @ 105° C., .000029. Use: Plasticizer. Availability: Pilot-plant quantities. Chas. Pfizer & Co., Inc.

1,2,3-TRICHLORO-1,1-DIFLUOROETHANE

$CHCl_2CClF_2$. B.P., 71-73°, d^{25} 1.5447, n^{25} 1.3889. A colorless liquid of chlorohydrocarbon odor. Insoluble in water but soluble in chlorinated hydrocarbons. Use: Research intermediate. Availability: Laboratory scale. Columbia Organic Chemical Co.

1,1,2-TRICHLORO-1-FLUOROETHANE

$CFCl_2CH_2Cl$. M.P., 104.7°; B.P., 88-90°; d^{20} 1.4921, n^{20} 1.4248. A colorless liquid of characteristic chlorohydrocarbon odor; insoluble in water and soluble in alcohol and ether. Uses: Research intermediate. Availability: Research quantities. Columbia Organics Chemical Co.

1,1,2-TRICHLORO-2-FLUOROETHANE

$CHCl_2CHFCl$. B.P., 101-103°; d^{17} 1.5497; n^{17} 1.5492. A colorless liquid of chlorohydrocarbon odor. Insoluble in water but soluble in alcohol or ether. Available in research lots. Columbia Organic Chemicals Co.

TRIETHYL ACONITATE

$C_{12}H_{18}O_6$. M.W., 258.3; colorless liquid; B.P. @ 1 mm Hg., 121-2° C.; R. I. @ 24.5° C., 1.4527; Sp.G. @ 24.5° C., 1.096; Evaporation rate ($gm/cm^2/hr.$) @ 105° C., 0.000127. Suggested use: Plasticizer. Availability: Pilot-plant quantities. Chas. Pfizer & Co., Inc.

TRIETHYL THIOPHOSPHATE

$(C_2H_5O)_3PS$. M.W., 198; pale yellow to colorless liquid with a sharp terpene odor; B.P., about 100° C. at 16 mm.; Sp.G., 1.113 at 20° C./4° C. Very slightly soluble in water but soluble in most organic solvents. Suggested for use as an intermediate for synthesis. Availability, semi-commercial quantities. Monsanto Chemical Co.

1,1,1-TRIFLUORO-2,3-DICHLOROPROPENE

$CHCl{:}CClCF_3$. M.W., 164.96; D., 1.4653 @ 20°/4° C.; R.I., 1.3670 @ 20° C.; B.P., 53.7° C.; F.P., —109.2° C.; insol. in water; odor, sweet; color, water white. Chemical properties: Possesses a reactive double bond. Suggested uses: As a fluorinated intermediate for the preparation of fluoroplastics and other organic fluorine materials. Availability: Small quantities for experimental investigation. Halogen Chemcals, Inc.

TRIHEXYL ACONITATE

$C_{18}H_{32}O_6$. M.W., 426.57; slightly yellowish liquid; B.P. @ 1 mm Hg., above 225° C.; R.I., @ 25° C., 1.4560; Sp.G., @ 25° C., 0.973; Evaporation rate ($gm/cm^2/hr.$) @ 105° C. Use: Plasticizers, particularly good for low-temperature in vinyls. Availability: Research quantities. Chas. Pfizer & Co., Inc.

TRIISOAMYLAMINE

$(C_5H_{11})_3N$. M.W. (calcd.), 227.42; clear, water white liquid; odor, pungent amine; freezing point, below —65° C.; I.B.P., 218° C.; F.B.P., 246.2° C.; vapor pressure, log p = —2801/T + 8.346; flash point, 215° F.; Sp.G. at 20°/20° C., 0.785; viscosity at 25° C., 2.40 centipoises. Use: As an intermediate. Available in pilot-plant quantities. Sharples Chemicals, Inc.

TRIISOBUTENYL SUCCINIC ANHYDRIDE

$C_{12}H_{22}CHCOOCOCH_2$. M.W., 266.4; B.P., approx. 190° C. at 10 mm.; light yellow, waxy solid at room temperature, softens and melts at higher temperatures. Insoluble in water, soluble in acetone and alcohol. Suggested as intermediate for resins, surface active agents, plasticizers, and as reagent to decrease water solubility of reactive products. Available in commercial quantities. Monsanto Chemical Co.

3,5,5-TRIMETHYLHEXALDEHYDE

$(CH_3)_3CCH_2CH(CH_3)CH_2CHO$. M.W., 142.23; Sp.G., 0.826 @ 20°C. B.P., 164°C. (763 mm.); R.I., 1.4211 @ 20°C.; Color, water white; Odor, sweet. Chemical properties: Reactions typical of the aldehyde group. Suggested uses: organic syntheses, perfume. Availability: research quantities. Genesee Research Corp.

3, 5, 5-TRIMETHYLHEXANOL

$CH_2C(CH_3)_2CH_2CH(CH_3)CH_2CH_2OH$. M. W., 144.25; B.P., 194° C.; Sp.G., 25° C./4° C. 0.8236; R.I., ND 25°C. 1.4300; flash point (open cup) 200° F.; trimethylhexanol content 97.5% minimum. Clear, colorless liquid. Insoluble in water; completely miscible with methanol, acetone, ethyl acetate, ethyl ether, benzene, cyclohexanone, petroleum ether and chloroform. Can be readily converted to esters via reaction with acids, acyl halides, acid anhydrides or other esters (alcoholysis). The high purity of this single nonyl alcohol isomer suggests its use where products of known structure and purity are desired. Possible applications include: Solvent in lacquer formulation; anti-foam and froth flotation agent; intermediate in the preparation of ester-type plasticizers, lubricating oil additives, synthetic lubricants, surface active agents, modified alkyd resins, disinfectants and germicides. Commercially available. E. I. du Pont de Nemours & Co. (Inc.)

DI(3,5,5-TRIMETHYLHEXYL) ISOPHTHALATE

$C_6H_4(COO(CH_2)_2CH(CH_3)CH_2C(CH_3)_3)_2$. M.W., 418.6; B.P., 217-218°/1 mm.; Sap. eq., 208.5; Odor, sweet burnt odor; Color, light yellow. Chemical properties: Undergoes typical ester reactions, although somewhat sluggishly. Suggested uses: vacuum diffusion pumps, plasticizer, lubricant. Availability: research quantities. Genesee Research Corp.

2,3,5-TRIPHENYL TETRAZOLIUM CHLORIDE

$C_6H_5NN(C1)(C_6H_5){:}NC(C_6H_5){:}N$. M. W., 334.8. A nearly white powder readily soluble in water and alcohol. Suggested for use in the determination of the germinability of seeds. Available in experimental quantities. National Aniline Division, Allied Chemical & Dye Corp.

TRISODIUM PHOSPHATE HEXAHYDRATE

$Na_3PO_4.6H_2O$. M.P., 110° C. Colorless crystals with Ng 1.477, Nm 1.473, and Np 1.462. A stable hydrate of normal trisodium phosphate. 1% water solution has pH of 11.6. Suggested uses: Wherever a more stable and concentrated crystalline trisodium phosphate is desired. Availability: Commercial quantities. Victor Chemical Works.

VANADYL SILICATE

Green crystals of indefinite composition. Insoluble in water, acetone, alcohol and ether. Reacts with conc. HCl and conc. H_2SO_4. Available in experimental quantities. City Chemical Corp.

XYLENESULFONIC ACID

Approximate composition: xylenesulfonic acid, 95%; xylene, 2.5%; sulfuric acid, 1%; water insoluble material, 1.5%. Acid number, 300. Suggested uses: catalyst; curing accelerator; intermediate for dyestuffs, pharmaceuticals, etc. available in semi-commercial quantities. Wyandotte Chemicals Corp.

YTTRIUM PHOSPHATE

$YPO_4.2H_2O$. M.W., 220. White powder. Insoluble in water. Available in experimental quantities. City Chemical Corp.

ZINC BENZOATE

$Zn(C_6H_5COO)_2$. M.W., 307.5. White powder. Slightly soluble in water, less if warmed. Use: Retardant in rubber vulcanization. Available in experimental quantities. City Chemical Corp.

ZINC PROPIONATE

$Zn(C_3H_5O_2)_2$. M.W., 170.1. White powder, slightly soluble in water. Use: treatment of athlete's foot; fungicide. Amend Drug & Chemical Co.

ZINC STEARATE #801 (U.S.P.)

Comb. ZnO, 14.3-14.8%. Moisture content 0.3-0.5%. Bulk average: 120-130 fl. oz./lb. White powder, M.P., 115-120° C., 100% thru 200 mesh. No odor. Insoluble in water, lower alcohols, esters, chlorinated solvents, mineral spirits, mineral oils, waxes, benzol, toluol and xylol. Use: Cosmetics, pharmaceuticals, plastics, rubber molding, paint, varnish and lacquer. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

ZINC STEARATE #802 (U.S.P.)

Comb. ZnO, 16.0-16.5%. Moisture content, 0.3-0.5%. Bulk average: 115-120 fl. oz./lb. White powder, M.P. 130-135° C., 100% thru 200 mesh. No odor. Insoluble in water, lower alcohols, esters, chlorinated solvents, mineral spirits, mineral oils, waxes, benzol, toluol and xylol. Use: Rubber molding, paints, varnish, lacquer, sanding sealers. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

SPECIALTIES

911 ACIDS, GRADE I

Light colored, dehydrated castor oil acids. Iodine value, 150; acid value, 194. Suitable for manufacture of synthetic oils, alkyds, resins, and protective coatings. Replacement for oleic acid in many applications such as emulsifying agent. Baker Castor Oil Co.

911 ACIDS, GRADE II

Light colored, dehydrated castor oil acids. Iodine value, 140; Acid value, 194. Suitable for manufacture of synthetic oils, alkyds, resins, and protective coatings. Replacement for oleic acid in many applications such as emulsifying agent. Baker Castor Oil Co.

ACETAMINE* RED BE

An economical, non-subliming acetate color that produces bright red shades on both acetate and nylon. Dyeings made with this product exhibit good light and washing fastness and on both materials possess very good resistance to crocking, hot moist pressing, sublimation and dry cleaning, and discharge well. Recommended for use alone or as a shading component for dress goods, draperies, linings, and many other uses where shade brilliance is desirable. Has very good dispersion properties as well as excellent affinity and yields level, well penetrated dyeings. Also suitable as a printing color for acetate and nylon where the tendency to mark-off is very slight in both light and heavy prints. E. I. du Pont de Nemours & Co. (Inc.). *Trademark

ACETAMINE* RUBINE 3B

Especially recommended for the production of bluish rubine shades that exhibit good brightness on either acetate or nylon. The blue shade of this direct dyeing acetate color recommends its use as a base for a wide range of light fast wines, clarets, bordeaux and maroons. Possesses very good fastness to both dry and wet crocking, hot moist pressing and has good resistance to washing at 105°F, dry cleaning and sublimation. Can be discharged to a slightly tinted white and produces speck-free prints by the usual printing methods. Suitable for a variety of materials, such as dress goods, draperies, linings and many decorative fabrics that require good fastness to washing and dry cleaning. Easily dispersed, builds up slowly on the material and absorbs well at high temperatures. Effect threads, such as silk and wool, are dyed while cotton and rayon are considerably stained. E. I. du Pont de Nemours & Co. (Inc.) *Trademark

ACETAMINE* YELLOW CG

A highly dispersible azo dye especially prepared for application to acetate rayon and yields attractive greenish-yellow shades on either bright or delustered stock. Has very good fastness to gas-fume fading, crocking, hot moist pressing and dry cleaning. In addition, it possesses fairly good fastness to light. Recommended for dyeing crepes, taffetas, satins and other filament fabrics and spun yarns for knitted wear. Also suitable for use on certain nylon fabrics. Its increased fastness to light on this fiber makes it interesting for application to furniture coverings, draperies and similar materials. Should not be used

A page from the Stauffer Catalog

NUMBER ELEVEN IN A SERIES

TARTARIC ACID

Other Names . . . . Dextro-Tartaric Acid, Dihydroxy Succinic Acid.

Formula . . . . . $C_4H_6O_6$ or $C_2H_2(OH)_2(COOH)_2$.

Properties . . . . . Colorless, odorless, acid taste, translucent anhydrous monoclinic prismatic crystals. Rotates plane polarized light to right. Stable in dry air, otherwise slightly hygroscopic. Melting Point 170°C or 338°F. Specific Gravity 1.76. Very soluble in water and alcohol, soluble in ether.

Grades . . . . . U.S.P.; Snowhite Powder; Snowhite Granular. (Mesh sizes between 20 and 100.)

Analysis . . . . . Tartaric Acid 99.8%
Ash 0.03%
Heavy Metals ..... 1 to 5 parts per million (Calc. as Lead)
Oxalates .....negative
Sulphate .....negative

Meets all requirements of the United States Pharmacopoeia XII official from November 1, 1942.

Principal Uses . . . Manufacture of tartrate compounds, chemicals and esters, and derivatives for organic synthesis. The acid is employed in certain types of photographic work for printing and developing. Some of the iron salts of Tartaric Acid are light sensitive and hence find application in blue-printing. The common commercial esters are di-ethyl and di-butyl tartrates, which are used as plasticizers in the manufacture of lacquers. The textile industry employs Tartaric Acid as a tendering agent for cotton fibre; the calico printer uses the acid for controlling the liberation of chlorine from bleaching powder; it is used in the production of a number of dyestuffs; as a "resist" for aluminum salts and other mordants and in the discharge colors for Turkey-red. It is also used in the mordant bath for dyeing wool; for brightening the color of silk after dyeing, and in the rayon industry.

The acid is extensively employed in sweetmeats, confectionery products, effervescent beverages and medicinals, wines, seidlitz powders, bakery products, gelatin desserts, and as an ingredient in tartar baking powder. Other uses include metal coloring formulas; in dilute solutions for the removal of deposits and other scale from containers and equipment in wineries and dairies.

Packing . . . . . Kegs — 100 lbs.; Barrels or Drums — 250 lbs.

Shipping Regulations None.

Stocks . . . . . San Francisco, Calif.; New York, N. Y.; Chicago, Ill.

STAUFFER PRODUCTS

BHC (Benzene Hexachloride)
Borax
Boric Acid
Carbon Bisulphide
Carbon Tetrachloride
Caustic Soda
Chlordane
Chlorine
Citric Acid
DDT (Dichloro Diphenyl Trichloroethane)
Silicon Tetrachloride
Sodium Hydrosulphide
Sulphur (Specially processed for all industrial uses)
Sulphur Chloride
Sulphuric Acid
Tartaric Acid
Textile Stripper
Titanium Trichloride
Toxaphene (Chlorinated Camphene)
2, 4-D (Acid, Isopropyl Ester, Amine Salts)

Stauffer CHEMICALS SINCE 1885

STAUFFER CHEMICAL CO.

420 Lexington Avenue, New York 17, N.Y. · 221 North LaSalle Street, Chicago 1, Illinois
555 South Flower Street, Los Angeles 13, Cal. · 636 California Street, San Francisco 8, Cal.
424 Ohio Bldg., Akron 8, O. · Apopka, Fla. · N. Portland, Ore. · Houston 2, Tex. · Weslaco, Tex.

on nylon articles that will be worn in contact with the body. Outstanding discharge properties. Recommended for use as a ground shade for white or colored discharge patterns. Also suitable for printing, is unaffected by metals and can be applied in all conventional dyeing equipment. This direct dyeing acetate color disperses readily and completely in the dyebath, and transfers and exhausts well, producing clear, full bodied dyeings. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

#1153 ADGRIP ADHESIVE BASE

Solids 50% Ph 8.8 C.P.S. 210. Recommended where conventional animal, vegetable, and latex adhesives are unsuitable. Suitable for laminating paper, metal foils, fabric and leather to themselves or to glass, metal, asphalt, cork, plastics and wood. Commercially available. Adhesive Products Corp.

#1790 ADGRIP ADHESIVE BASE

Low priced adhesive base for surfaces difficult to adhere. May be compounded with latex vinyl emulsions or starch for form adhesives which will adhere to metal, plastic, and coated surfaces. Ph 8.3, Solids 48% C.P.S. 260. Commercially available. Adhesive Products Corp.

AHCOWET RS, ANHYDROUS

A viscous, dark red oil. 98% active ingredients. Highly concentrated synthetic emulsifying agent for use under neutral, acid or hard water conditions. Excellent emulsifying, wetting and rewetting agent, with concentrations of calcium and magnesium salts up to 750 ppm. having no effect on its efficiency, application and use as a surface-active agent 5%-10% renders solvent solutions of insecticides, such as DDT and Chlordane, self-emulsifiable. Free fatty acid 16.0-18.0%. pH 5.4-5.8. Available in commercial quantities. Arnold, Hoffman & Co., Inc.

ALATHON* POLYTHENE RESINS A, B, C, D AND E

A series of polythene resins of varied molecular weight. Chemically inert, impervious to water and flexible at low temperatures. Characterized by outstanding chemical, solvent and water resistance. Tasteless, odorless and nontoxic. Electrical properties are excellent. Suggested for use as coatings for paper and for improving or toughening waxes used in coating paper. Also for electrical potting, coating, and sealing; for abrasion resistant inks; for fabric coating, plastic processing aids, anti-static coatings, investment casting, candles, crayons, etc. Available in commercial quantities. E. I. du Pont de Nemours & Co. Inc.)
*Trademark

ALROLUBE 10

An amber, viscous oil; soluble in propyleneglycol and common brake fluid solvents; does not swell rubber, recommended uses: as hydraulic fluid or base; lubricant. Commercially available. Alrose Chemical Co.

AMBERLITE IRC-50 (H)
(Analytical Grade)

A highly refined, essentially "C.P." synthetic resin deriving cation exchange activity from carboxylic acid groups. Supplied in the free acid form. Spherical particles; screen grading (wet) 16 to 50 mesh; effective size, 0.35 to 0.50 mm.; uniformity coefficient 2.0 maximum; moisture content 40 to 500% ;density 44 to 48 lb/ft.^{3} (backwashed and drained bed volume). Suggested uses: adsorption and purification of basic amino acids, proteins, antibiotics, alkaloids, vitamins, enzymes, and miscellaneous other organic and inorganic bases; chemical analysis and research. Availability: quantities up to 25 pounds furnished by Fisher Scientific Co. and Eimer and Amend. Commercial quantities: Rohm & Haas Co.

AMBERLITE IR-105

A synthetic resin deriving cation exchange activity from sulfonic acid groups, supplied in the sodium salt form. Spherical particles; effective size 0.4 to 0.6 mm.; screen grading (wet), 16 to 50 mesh; uniformity coefficient, 1.7 max.; moisture content 40 to 50%; density, 47 lb./ft.^{3} in place (backwashed and drained bed volume). Suggested uses: water conditioning, exchange chromatography, catalysis. Availability, plant scale. Rohm & Haas Co.

AMBERLITE IR-105 (H)
(Analytical Grade)

A highly refined, essentially "C.P." synthetic resin deriving cation exchange activity from sulfonic acid groups. Supplied in the free acid form. Spherical particles; screen grading (wet), 16 to 50 mesh; effective size, 0.4 to 0.6 mm.; uniformity coefficient, 1.7 maximum; moisture content 40 to 50%; density, 47 lb./ft.^{3} in place (backwashed and drained bed volume). Suggested uses: analytical work, exchange chromatography, catalysis, general research. Availability: quantities up to 25 pounds furnished by Fisher Scientific Co. and Eimer and Amend. Commercial quantities: Rohm & Haas Co.

AMBERLITE IR-120

A synthetic resin deriving cation exchange activity from nuclear sulfonic acid groups. Supplied in the sodium salt form. Bead-like, granular; moisture content 35 to 45 percent; screen grading (wet) 16 to 50 mesh; effective size, 0.4 to 0.6 mm.; uniformity coefficient, 2.0 maximum; density, 48 lb/ft^3. in place (backwashed and drained bed volume). Suggested uses: in deionization, dealkalization, and softening of water; in the treatment of aqueous solutions in general for removing, exchanging or concentrating metal ions; as a cation exchanger of high capacity, especially where resistance to attrition, heat, and oxidizing and reducing media is essential. Commercially available: Rohn & Haas Co.

AMBERLITE IRA-400

An anion exchanger, a strongly basic synthetic resin which splits neutral salts, adsorbs anions of very weak acids over a wide pH range, and catalyzes reactions. Supplied in the chloride salt form. Light brown, granular; screen grading (wet) 20 to 50 mesh; effective size, 0.40 to 0.60 mm.; uniformity coefficient, 1.4 to 1.7; density, 42 lb./ft^3. in place (backwashed and drained bed volume). Suggested uses: adsorption and purification of amino acids, proteins, and other compounds capable of existing as anions below pH 10; for removal of silica hydrogen sulfide and other weak acids from water or aqueous solutions. Availability: Plant scale. Rohm & Haas.

AMBERLITE IRA-400 (OH)
(Analytical Grade)

A highly refined, essentially "C.P." synthetic resin deriving anion exchange activity from strongly basic, modified amine groups. Supplied in the hydroxyl form. Light brown, granular; screen grading (wet), 20 to 50 mesh; effective size, 0.4 to 0.6 mm.; uniformity coefficient, 1.7 maximum; moisture content, approximately 50%; density, 42 lb./ft^3. in place (backwashed and drained bed volume). Suggested uses: catalysis; adsorption and purification of amino acids, proteins, and other compounds capable of existing as anions below pH 10; removal of silica and hydrogen sulfide; chemical analysis and research. Availability: quantities up to 25 pounds furnished by Fisher Scientific Co. and Eimer and Amend. Commercial quantities: Rohm & Haas Co.

AMBERLITE W-1

A 20% aqueous solution of a stable, rather viscous, and infinitely dilutible polymer which may be converted to insoluble films by heat or metallic salts. pH, 7.0 to 8.5; color, amber and slightly turbid; Sp. G. at 25°C., 1.07; viscosity (20% in water), 22 to 50 poises. Suggested uses: in formulations of special cements and adhesives; as a means of improving the dry and wet physical properties of paper; as a thickener, as a protective colloid and emulsifying agent. Rohm & Haas Co.

AMBERLITE XE-81

A special physical mixture of two ion exchange resins; a high capacity sulfonic cation exchanger and a strongly basic, highly reactive anion adsorbent. Supplied in the fully regenerated form, ready for immediate use in deionization. Suggested uses: mixed bed deionization of water and aqueous solutions to a final ionic solids content of less than 0.02 parts per million. Availability: analytical or "C.P." grade in quantities up to 25 pounds furnished by Fisher Scientific Co. and Eimer and Amend. Commercial quantities: Rohm & Haas Co.

AMPROZYME

A water soluble biological product high in Amylase and Protease but also containing Catalase, Rennet, Lipase, Invertase, and other enzymes. Characterized by its high temperature stability. Used in textile desizing, and general starch and protein solubilization. Jacques Wolf & Co.

ANTI-SKINNING AGENT
(Aska)

A synthetic organic product, used to prevent the formation of surface skin in packaged paints and varnishes. Effective in amounts of 0.1% to 0.3% by volume on the paint, enamel or varnish. Volatile and when used in normal dosages does not produce any deleterious effects in paints or varnishes Does not affect the drying time of paints or varnishes or not have an objectionable odor and can be used in any synthetic or orthodox paints, enamels and varnishes. Advance Solvents & Chemical Corp.

APPRAMINE SN

Catonic Softener. An acidic dispersion of a high molecular weight fatty amide; almost completely free of amino nitrogen. Light tan colored soft paste with mild odor of acetic acid. Disperses in warm water to form opalescent solutions. pH of 2% aqueous solution is 4.2 to 4.4. Excellent softening agent on all fabrics; has very little effect on shades or on light fastness of dyestuffs. Compatible with urea-formaldehyde resin solutions. Warwick Chemical Co.

#1543 AQUAGRIP

A waterproof heat seal adhesive for adhering glass to metal in the manufacture of aquariums, show cases, displays etc., black. Softening point 180° F. Does not become brittle. Commercially available. Adhesive Products Corp.

ARBONEELD* B—
(Urea-Formaldehyde Composition)

A 65% aqueous solution of urea-formaldehyde reaction products and uncombined formaldehyde in which the over-all mole ratio of formaldehyde to urea is approximately 5 to 1. Clear, colorless, mobile liquid; highly stable in normal storage; M.P. -22°C; B.P. above 90°C; Sp. G. 15.6°C/15.6 1.230-1.260; pH 6.8-8.5; completely miscible with water and with methanol. A versatile intermediate to thermosetting resins, which undergoes the condensation reactions typical of formaldehyde and of monomeric methylolureas. Commercially available. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

ARCCO MASTIC ADHESIVE 684-50B

High viscosity resin emulsion adhesive for adhering linolieum, rubber, asphalt and other hard floor coverngs to wood, concrete, painted, shellacked, waxed, or varnished surfaces Suitable for trowel application. Durable, waterproof bond. American Resinous Chemicals Corp.

ARWAX 613-5

Concentrate of butyl rubber in microcrystalline wax. Used as addend for improving tack, flexibility, adhesion and moisture vapor transmission rate of microcystalline wax laminants. American Resinous Chemicals Corp.

ARWAX No. 1044-2

Concentrate of polyethylene in paraffin wax. Small percentages are easily blended with paraffin wax to increase tensile, gloss and scuff-resistance, improve heat sealing properties, raise blocking temperature and impart grease resistance to paraffin wax coatings. American Resinous Chemicals Corp.

BAKER's 6040-781 SOLUTION

A 60% solution of gelled castor oil in toluol. Brown solution suitable as a plasticizer and toughening agent for nitrocellulose, and as an impregnating material for gaskets. Baker Castor Oil Co.

BETACHLOR

58% 2, 2'-Dichloroethyl either by wt., 42% 2, 2'-dichloroisopropyl either by wt.; clear liquid, very slightly yellow; distillation range (760 mm), 160°C.-183°C.; Sp. G. at 20°C./20°C., 1.175; wt. per gal. at 20°C., 9.8 lbs.; acidity (as HCl), less than 0.002%; moisture content, 0.04%; flash point (COC), 185°F.-190°F.; Kauri Butanol value, 59; sol. in water at 25°C., 0.87 parts/100 by wt. Suggested uses: As a solvent and extractant for oils, fats, waxes and greases; used for extraction processes of lubrication oil manufacture. Textile conditioning, desizing, softening, and spotting agent; aid in kier-boiling and mercerizing. Intermediate for manufacture of resins and elastomers. Lacquer, enamel, varnish, and paint solvent. Component of cleansing compositions, solvent emulsion cleaners, scouring compounds, drycleaning compositions, and penetrating agents. Insecticide and soil fumigant. Available in commercial quantities. Wyandotte Chemicals Corp.

BI-CON 4-4-4

A vitamin supplement for the feed industry. Contains per pound: 4 grams riboflavin from fermentation sources, 4 grams pantothenic acid as calcium pantothenate, 4 grams niacin, with suitable diluents and tricalcium phosphate to improve the flow characteristics. Certain other vitamins naturally resulting from fermentation also are present in unspecified amounts. Uses: animal and chicken feeds. Availability: commercial. Chas. Pfizer & Co., Inc.

BI-CON APF-3

A vitamin supplement for the animal and chicken feed industry. Contains 3 milligrams of vitamin B_{12} per pound. Designed to supply the necessary animal protein factor for adequate utilization of protein materials. Mixture of dried extracted streptomycin solubles and presscake and solvent-extracted soybean meal with a minor percentage of starch and tricalcium phosphate to aid the flow characteristics. Use: Animal and chicken feed industry. Availability: commercial. Chas. Pfizer & Co., Inc.

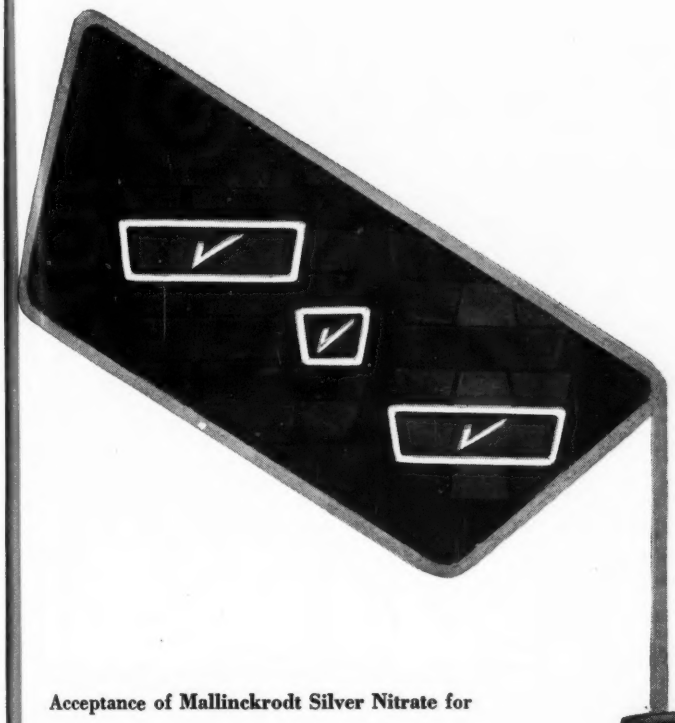
BI-CON RIBO-4

A vitamin supplement for the animal and chicken feed industry. Contains 4 grams of riboflavin per pound and other vitamnis of the B-complex in unspecified amounts. The riboflavin is derived from fermentation sources. Mixture of dried riboflavin fermentation solubles and presscake, with suitable diluents and a very minor percentage of tricalcium phosphate to aid the flow and mixing characteristics. Uses: Animal and chicken feeds. Availbility: commercial. Chas. Pfizer & Co., Inc.

Mallinckrodt
SILVER SALTS
for industry

SILVER NITRATE
SILVER CYANIDE
SILVER OXIDE

are made only from carefully selected SILVER BULLION



Acceptance of **Mallinckrodt Silver Nitrate** for the exacting manufacture of photographic films and silvering of mirrors indicates its supreme quality better than any specifications could. **Mallinckrodt Silver Nitrate** is so pure that it is light-stable. The foreign heavy metal content is so low that a whole carload contains only about one cubic inch.

The same fine raw material, the same skillful processing, the same high standards give all **Mallinckrodt** silver salts this same ***uniform, dependable purity.***

Silver compounds for Industrial, Photographic, Medical and Analytical Uses

Silver Metal A.R. Precip.	Silver Acetate
Silver Carbonate A.R.	Silver Chloride
Silver Chloride A.R.	Silver Cyanide
Silver Iodide	Silver Lactate
Silver Nitrate C.P. Crystals	Silver Nitrate A.R. (A.C.S.)
Silver Nitrite	Silver Oxide U.S.P. IX
Silver Protein Mild U.S.P. XIII	Silver Protein Strong N.F. VIII
Silver Sulfate	Silver Sulfate A.R. (A.C.S.)
Lunar Caustic U.S.P. XIII (No. 1)	Lunar Caustic No. 2

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UNIFORM, DEPENDABLE PURITY

BLEND CC-49

A chlorinated solvent mixture consisting of 5 parts (by volume) methylene chloride and 1 part perchlorethylene. Used to prepare a motor cleaning mixture by mixing with Stoddard Solvent. A heavy, clear, colorless, mobile liquid with pleasant odor. Miscible with petroleum distillates, alcohol, ether and similar organic fluids. Weight 11.5 lbs./gal. at 68°F. Nonflammable. E. I. du Pont de Nemours & Co. (Inc.)

BONDCOTE 1051 SERIES

Pigmented resin emulsion base coat. Gives good adhesion for nitrocellose or vinyl resin lacquer top coats on latex saturated paper. Reduces coating cost. Improves gloss, fill and durability. American Resinous Chemicals Corp.

CADMINATE*

An organic cadmium compound formulated for the control of dollar spot and copper spot fungus diseases of turf. Availability: Pilot-plant quantities. Mallinckrodt Chemical Works.
*Trademark.

CALCOSAL FAST YELLOW

A new anthraquinoid vat dye in paste, powder, and printing ink paste which produces a clear bright tone yellow shade with excellent general fastness properties. The light fastness is unsurpassed for a yellow dye of this shade and even pale shades withstand a 40-hour Fade-Ometer exposure. Darker shades withstand as much as 100 hours of Fade-Ometer exposure. Important fastness ratings are: Light 2%=6; 4%=6; 16%=7; Wash Test No. 4=5; Chlorine 4-5; Peroxide 4-5; Open Kier Boil 5. Calco Chemical Div., American Cyanamid Co.

CALCO SOLUBLE VAT GREY F

A new soluble vat dye, derived from an anthraquinoid vat dye exclusive to Calco, is recommended primarily for printing cotton or viscose rayon although it is also applicable in dyeing. The fastness properties are excellent except with respect to light, where the fastness is adequate for the majority of printed patterns. Important fastness ratings are: Light ½%=3-4, 1½%=5-6, 3%=6. Wash Test No. 4=4—5, Chlorine 4, Dry Cleaning 4-5, Perspiration 5. Calco Chemical Div., American Cyanamid Co.

•CARBANTHRENE GOLDEN ORANGE 4R DOUBLE FLAKES

Possesses the all-around fastness of this type of vat dyes. It levels and penetrates well in light shades. Especially suitable for producing tans, browns, russets, etc. on rayon and silk as well as on cotton in all forms. Possesses excellent fastness to sea-water, perspiration, chlorine, cross-dyeing and rubbing and good fastness to light, washing, boiling soap and soda ash. National Aniline Division, Allied Chemical & Dye Corp.

CATALYST AC (For Textile Resins)

Light yellow liquid, pH 7.7. Rapid-curing catalyst for urea and melamine textile resins. Offers longer bath life, shorter cure time, better resin retention than ammoniacal catalysts. Availability: commercial quantities. Monsanto Chemical Co.

CEREX 250
(Injection Molding Material)

A high heat-resistant styrene copolymer injection molding compound. A.S.T.M. (oil bath) heat distortion temperature of 108-112°C. All other properties similar to polystyrene. Availability: commercial quantities. Monsanto Chemical Co.

CHROMACYL* BRILLIANT PINK 3B

A special acid color producing a wide range of bright bluish-pink shades that should be of particular interest to wool dyers. Especially useful for the production of pastel shades. Also provides an excellent base for brilliant wines and maroons. Has good fastness to light and washing and exhibits equally good resistance to dry cleaning, crocking, perspiration, fulling, hot moist pressing and cold water spotting. Its use is suggested on a variety of materials such as women's suitings, sportswear, bathing suits and carpet yarns. Has good solubility and possesses excellent level dyeing properties. Has a slow development rate which allows thorough, uniform penetration. Unaffected by metals. In multi-fiber work, wool, silk and nylon are dyed while cotton, viscose and acetate rayon are noticeably stained. Also shows good affinity dyed neutral. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark.

CHROMACYL* YELLOW GR

A special acid dyestuff recommended for a range of fast-to-light reddish-yellows which have very good resistance to hot moist pressing, dry cleaning, salt water spotting and good fastness to washing, fulling and perspiration. Especially useful for dyeing woolens and worsteds for women's wear and for bathing suit, sweater, carpet and knitting yarns as well as other articles that are designed for long service. Can be applied by the usual methods in conventional dyeing machines and is a very level dyeing color, showing excellent transfer at the boil. Has good penetrating and exhausting properties. When used for dyeing multi-fiber or effect thread materials, acetate fibers are noticeably stained, cotton and rayon are stained a trace, while silk and nylon are dyed. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

COMPOUND 101

Non-ionic synthetic. Light yellow to light brown liquid. Suggested uses: Grease-cleaning, solvent-emulsion type. Availability: Semi-commercial quantities. Monsanto Chemical Co.

COPPERIZED CZC

An improved wood preservative, stemming from CZC-Chromated Zinc Chloride, a time-tested wood preservative, and comprising the same basic ingredients, further fortified by cupric chloride, a fungicide of exceptionally high toxicity, which greatly increases preservative value and termite repellency and extends service life. Qualifies as a fire retardant, and provides treated lumber that is clean, odorless, safe to handle, and paintable. E. I. du Pont de Nemours & Co. (Inc.)

DEE-4

A free-flowing synthetic detergent powder specially applicable for use in mechanical and automatic washing machines. Availability: commercial. Onyx Oil & Chemical Co.

DEMOCON C (Series)

A series of chemical bases for the cosmetic trade. Simple dilution with from one to four parts water will convert these bases into consumer items. Bases are scientifically balanced, convenient to use and require no technical knowledge or elaborate equipment for finishing. Includes chemical bases for all purpose face cream, vanishing cream, hand cream, hand lotion, etc. Demo Laboratories.

DEMOCON P (Series)

Chemical bases for the pharmaceutical trade requiring only the simple addition of one to two parts water to make up into ointment bases. P-100 with water makes up into a hydrophilic ointment base. P-200 with water makes up into an oil-type ointment base. Demo Laboratories.

DEMOCON T (Series)

This series includes versatile chemical bases which require only the addition of varying amounts of water to convert into a line of toiletries. Perfume and color, if necessary, can be added during the simple dilution procedure to promote distinctiveness and individuality of product. This series includes bases for cream deodorant, suntan lotion, insect repellent, brushless shave cream, cream shampoo, white cream hair dressing, cream hair pomade, etc. Demo Laboratories.

DEMOCON W-100

A mixture of liquid synthetic detergents 100% active, blended for high synergistic effect. Simple cold water dilution with from two to one hundred parts water with or without other ingredients added will make a large variety of individual cleaning products for consumer sale. These include consumer products for dish washing, glass rinsing, car wash, rug and upholstery shampoo, wall and woodwork cleaner, window and windshield cleaner, etc. Formulas for making any of these consumer products are furnished. Demo Laboratories.

DEMOCON W-200

Chemical base for furniture cleaner and polish. Simple addition of three parts water produces an effective consumer product. Demo Laboratories.

DEMOCON W-300

Chemical base for automobile cleaner and polish. Addition of several parts water makes an efficient consumer product for cleaning and wax polishing automobiles in one operation. Demo Laboratories.

DEMOCON W-400, W-500

Carnauba wax bases which when diluted with varying amounts of water, make up into high-grade floor wax polishes. W-400 makes a liquid floor wax of the "no rubbing" type. W-500 is an emulsion paste type which can be buffed to high gloss. Demo Laboratories.

DEMOCON W-600

Sanitizing agent and germicide. Powerful and effective yet odorless and harmless to humans and animals. Dilution with as much as fifteen parts water or compatible dry ingredients makes a liquid or dry type sanitizing agent suitable for use by restaurants, dairies, homes and institutions. One ounce of the resultant mixture per gallon of water will sanitize food and dairy equipment effectively and meets the adopted standards of the U. S. Public Health Service and the American Public Health Association. Diluted as much as three hundred times also is effective as a spray deodorant without itself imparting any noticeable odor. Demo Laboratories.

DEMOCON W-700

Chemical base for prevention of mold and mildew. When diluted with approx. four parts water, makes an effective product for industrial use or packaged for consumer sale. Demo Laboratories.

DEMOCON W-800

"Waterless" hand cleaner base. Dilution with four parts water makes an interesting product of jelly consistency with many industrial and household uses, where water either is unavailable or impractical against dirt, grease and stains imbedded in the skin, wood or metal surfaces. Demo Laboratories.

DEMOCON W-900

Air deodorant base. Simple addition of varying amounts of water will make either a drip, wick or spray type air deodorant effective in eliminating foul conditions, leaving air clean and sweet smelling. Demo Laboratories.

DETERGENT-SANITIZER CONCENTRATE

A liquid concentrate consisting of 100% active Onyx BTC (alkyl dimethyl benzyl ammonium chloride) and Neutronyx 600. Available in various proportions of BTC to Neutronyx, depending on application. Recommended as a base for the preparation of free-flowing germicidal cleaning powders. Availability: commercial. Onyx Oil & Chemical Co.

DETERGENT-SANITIZER POWDERS

Custom-made germicidal cleaning powders prepared from Onyx detergent-sanitizer concentrate with alkaline builders. Availability: To order. Onyx Oil & Chemical Co.

DIAZINE ORANGE DD

Produces, on cotton or rayon, yellowish-orange shades which change to reddish-orange when diazotized and developed with National Developer B. Yields excellent unions on cotton-rayon materials and discharges to an excellent white. Possesses good fastness to washing (III) and peroxide bleach, very good fastness to cross-dyeing and excellent fastness to perspiration, acids, alkalies, mercerizing, water, sea water and rubbing. National Aniline Division, Allied Chemical & Dye Corp.

DIAZINE ORANGE GR

New developed dye yielding on cotton, rayon and silk, bright orange shades when developed with National Developer B. Notable not only for the economy it affords but also for its easy dischargeability and excellent fastness to acids, alkalis and mercerizing. Possesses good fastness to fulling, perspiration, peroxide bleach and cross-dyeing. National Aniline Division, Allied Chemical & Dye Corp.

DIAZINE ORANGE RFW

An orange direct dye which, when diazotized or developed with National Developer B, yields brilliant reddish-orange shades of good fastness to cross-dyeing and mercerizing and very good fastness to washing, organic acids, perspiration, sea-water and water spotting. It discharges to a good white. National Aniline Division, Allied Chemical & Dye Corp.

DIAZINE RED BFW

A developed red of superior fastness to washing comparing favorably in this respect with Class III vat dyes, particularly when dyed on rayon. Produces soft, bluish-red shades of very good fastness to fulling, peroxide bleach, and mercerizing. National Aniline Division, Allied Chemical & Dye Corp.

DIAZINE SCARLET GFW

New non-dusting developed dye for cotton or rayon. When developed with National Developer B it produces bright, scarlet shades of superior fastness to washing. It yields good unions on cotton-rayon materials and, in addition, leaves acetate rayon practically unstained. Also possesses very good fastness to washing, perspiration, water, sea water and mercerizing. National Aniline Division, Allied Chemical & Dye Corp.

DIAZINE SCARLET RWD

A non-dusting, developed dye producing, on cotton or rayon, somewhat bluish-scarlet shades which, on diazotizing and developing with National Developer B, become deeper and yellower. Possesses excellent solubility, levels well, and yields excellent unions on cotton-rayon fabrics. Possesses good fastness to washing (III) and excellent fastness to perspiration, sea-water and organic acids. It discharges to an excellent white. National Aniline Division, Allied Chemical & Dye Corp.

DIAZINE VIOLET BL

A non-dusting, developed dye for cotton or rayon. In direct dyeings it yields reddish violet shades which, on diazotizing and developing with National Developer B, become appreciably bluer and brighter in shade and of good fastness to washing, stoving, mercerizing, dry rubbing, water-spotting and organic acids; very good fastness to mineral acid and excellent fastness to water, sea-water and perspiration. Yields excellent unions on cotton-rayon materials and dis-

Cowles CHEMICALS

DRYMET*

THE ECONOMICAL DETERGENT SILICATE

Cowles DRYMET, anhydrous sodium metasilicate, is the most highly concentrated form of sodium metasilicate available. It is more economical to use, on the basis of both Na_2O (alkalinity) and SiO_2 (silicate) than any other type of hydrated or anhydrous detergent silicate, either compounded or by itself. DRYMET contains no water of crystallization.

DRYSEQ*

THE ALL-PURPOSE DETERGENT SILICATE

Cowles DRYSEQ, anhydrous sodium sesquisilicate, is a medium pH alkaline cleaner which will do fast, dependable work at a low cost to the user. It is a white, free-flowing powder, quickly and completely soluble in hot or cold water—containing 56.75% Na_2O—making it an economical base material for compounding.

DRYORTH*

THE HEAVY-DUTY DETERGENT SILICATE

Cowles DRYORTH, anhydrous sodium orthosilicate, is a powerful, speedy, heavy-duty cleaner with valuable penetrating and wetting-out properties, reinforced dirt-removing power and unusual emulsifying action. It is an anyhdrous, free-flowing powdered silicate containing not less than 60% Na_2O, which may also be used as an economical constituent of high pH cleaning compounds.

CRYSTAMET*

THE MEDIUM pH DETERGENT SILICATE

Cowles CRYSTAMET is a pure, perfectly white, free-flowing granular pentahydrate sodium metasilicate with the normal 42% water of crystallization. Suggested for compounding when it is desirable to lower the concentration of a finished product. Readily soluble—chemically stable—easy to handle. Can be used on medium pH jobs.

We'll be glad to send you our DRYMET File Folder containing complete technical information and suggested formulations.

PROMPT SHIPMENTS FROM CONVENIENT WAREHOUSE STOCKS....

**Reg. U. S. Pat. Off.*

Cowles Chemical Company

HEAVY CHEMICAL DEPARTMENT • CLEVELAND 3, OHIO

charges to a good white. National Aniline Division, Allied Chemical & Dye Corp.

DIAZOTYPE BLUE R SALT

$(C_8H_{10}N_3Cl)_2ZnCl_2$. M.W., 136 as free base. Yellowish crystalline solid about 33% strength on the basis of the base soluble in water. Suggested for use in Diazotype printing and Diazotype paper. Available in commercial quantities. National Aniline Division, Allied Chemical & Dye Corp.

DIAZOTYPE BLUE 3RD SALT

$(C_{10}H_{14}N_3Cl)_2ZnCl_2$. M.W., 164 as free base. Yellowish crystalline solid about 33% strength on the basis of the base. Soluble in water. Suggested for use in Diazotype printing and Diazotype paper. Available in commercial quantities. National Aniline Division, Allied Chemcial & Dye Corp.

DIHYDROSTREPTOMYCIN SULFATE

Crystalline form. High purity and potency. Minimum assay value of 725 mcgs./mg. Less than 1% unreduced streptomycin sulfate. Readily permits a solution of high concentrations which retain full clarity. Availability: Commercial quantities. Heyden Chemical Corp.

DIMETHYL HYDANTOIN-FORMALDEHYDE RESIN (DMHF)

Colorless to light yellow, nearly odorless, brittle lumps; average M. W. 240-300; initial softening point 60°C (140°F); density g./cc. 1.30. Dissolves readily in cold and hot water, methanol, ethyl acetate, methyl ethyl ketone, chloroform, methylene chloride, and hot glycerol. Insoluble in benzene, xylene, petroleum ether, diethyl ether, trichlorethylene, and carbon tetrachloride. Suggested for use in textile sizing, sizing and coating of paper, as a modifying agent for starch and protein adhesives, and as a blending agent for aqueous solutions of gums and resins. E. I. du Pont de Nemours & Co. (Inc.)

"DRYENE"* OIL UPGRADER

Viscous, straw-colored liquid of unusual value for the upgrading of natural drying oils and for the modification of alkyd resins by introducing increased conjugated unsaturation. Use of an alkyd resin modified with 5 to 10% of "Dryene" oil upgrader yields a finish which has excellent gloss and improved water, alkali, and print resistance. Such coatings through-dry very rapidly and produce finishes of the highest quality. Available in commercial quantities. Carbide and Carbon Chemicals Corp.
*Trademark.

DUPONOL* SN

A strong aqueous solution of the sodium salt of an alcohol sulfate (a thin, clear, yellow liquid with a cloud point of about 43°F.). Miscible with water in all proportions. pH at 10% dilution is approximately 8.5. Specifically designed for use in liquid shampoos. Should also find use as a liquid hand cleaner ingredient, and as an emulsifier. Possesses exceptionally high foaming power in both hard and soft water. Available in commercial quantities. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

DUPONOL* ST

A strong aqueous solution of the triethanolamine salt of an alcohol sulfate (a thin, clear yellow liquid with a cloud point below the freezing point of water). Miscible with water in all proportions. pH at 10% dilution is approximately 7. Specifically designed for use in liquid shampoos. Should also find use as a liquid hand cleaner ingredient, and as an emulsifier. Possesses exceptionally high foaming power in both hard and soft water. Available in commercial quantities. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

DU PONT DAIRY CATTLE SPRAY

A wettable powder residual insecticide containing 50% methoxychlor (bis (para methoxyphenyl) trichloroethane). Use: For control of flies, lice and certain other insects on dairy cattle and other livestock, and in dairy barns and premises. Approved by U.S.D.A. for use on dairy cattle as it does not contaminate milk of lactating animals. Containers: 4 oz., 1 lb., and 2 lb. containers. E. I. du Pont de Nemours & Co. (Inc.)

DU PONT LIVESTOCK SPRAY AND DIP NO. 30

A wettable powder insecticide containing benzene hexachloride and DDT which affords rapid knockdown and long residual control. Use: For control of wide range of insect pests including ticks, flies, lice and mange mites on cattle (except dairy cattle), sheep, horses and goats. Containers: 11 lb. and 55 lb. bags. E. I. du Pont de Nemours & Co. (Inc.)

DU PONT SCREWWORM SMEAR 220

A non-staining white larvicide containing diphenylamine and benzol in a stable emulsion formulation. Use: For the control of screwworm fly larvae which infest open sores on livestock. Kills larvae, repels flies and aids healing of wounds. Containers: pint, quart and gallon jars. E. I. du Pont de Nemours & Co. (Inc.)

EMCOL 61

A cream-colored soft semi-liquid material consisting of a blend of long chain substituted partially unsaturated fatty acid amides. Uses: As a hair conditioner and skin softener in cosmetic preparations. Commercially available. Emulsol Corp.

EMCOL 62

A cream-colored wax-like solid consisting of a blend of long chain substituted and partially unsaturated fatty acid amides. Uses: As a hair conditioner in cosmetic preparations. Commercially available. Emulsol Corp.

EMCOL 63

A cream-colored waxy solid consisting of a blend of long chain substituted and saturated fatty acid amides. Uses: As a bodying agent and conditioner in cosmetic preparations. Commercially available. Emulsol Corp.

EMCOL H72

A light amber clear liquid, consisting of a balanced blend of polyhydroxy alcohols incompletely esterified with higher fatty acids and partially esterified with di-carboxylic acids. Acid number: 35 to 40, pH of a 3% aqueous dispersion: 2.6 to 3.0, specific gravity 1.01. Uses: As emulsifier for chlordane in 4 lb. per U. S. gallon formulations in kerosene type solvents. Commercially available. Emulsol Corp.

EMCOL H74

A light amber clear liquid consisting of a balanced blend of polyhydroxy alcohols incompletely esterified with higher fatty acids and partially esterified with di-carboxylic acids. Acid number 34 to 41, pH of a 3% aqueous dispersion 2.6—3.0. Specific gravity 0.97—0.99. Uses: As an emulsifier for chlordane in 8 lb. or 10 lb. per U. S. gallon formulations and for Toxaphene in 4 lb. per U. S. gallon formulations in kerosene type solvents. Commercially available. Emulsol Corp.

EMCOL RGL

A soft cream colored blend of edible hydrophilic glycerol fatty acid esters. Color (Lovibond) 5¼" column: 35 Yellow, 3.5 Red maximum. Free fatty acid: less than 2.5%; free glycerine: less than 6%. Uses: As an edible emulsifier in plastic form. Emulsol Corp.

EMULSIFIER C

Non-ionic synthetic emulsifying agent. Light yellow to light brown paste. Suggested use: Emulsifier for chlordane. Availability: Semi-commercial quantities. Monsanto Chemical Co.

ERIEFORM BROWN RRF

A reddish-brown direct dye for formaldehyde aftertreatment. Possesses good fastness to washing, fulling, acids and rubbing and very good fastness to perspiration, water, sea water and cross-dyeing. National Aniline Division, Allied Chemical & Dye Corp.

ERIFON* FLAME RETARDANT

An aqueous solution of metallic salts with free hydrochloric acid. Use: A flame retardant for cellulosic fabrics. Containers: 13 gal. glass carboys; 50 gal. rubber lined steel drums. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

ESTRAMINE 95

A special fatty acid alkanolamine condensate possessing good wetting, foaming, and detergent characteristics. Especially designed for scouring sential. Availability: Commercial. Onyx Oil & and detergent applications where low cost is es Chemical Co.

EUMERCIN LR
(Wetting Agent)

A sulfated synthetic, branched chain alcohol. Clear straw colored liquid with a mild alcoholic odor. pH of 5% aqueous solution is 7.0 to 8.0. Completely miscible with water. Useful as a frothing and wetting agent in aqueous solutions which contain moderate amounts of electrolytes. Particularly effective in caustic soda solutions containing 5.0 to 17.0% NaOH. Warwick Chemical Co.

EUMERCIN NB
(Wetting Agent)

A water soluble phosphorated alcohol. Clear straw colored liquid with a mild alcoholic odor. pH of 5% aqueous solution is 7.0 to 9.0. Completely miscible with water. Although it has a marked effect on surface tension, it does not produce much froth. Particularly effective as a wetting agent and penetrant in aqueous solutions containing 1.5% to 6.0% NaOH. Useful as a penetrant in the causticizing treatment of textiles and as an aid in the removal of bottle labels. Warwick Chemical Co.

EXPERIMENTAL FUNGICIDE 224

A zinc mercury chromate with the empirical formula $7ZnO \cdot 2HgO \cdot 2CrO_3 \cdot 7H_2O$; a yellow powder with fine particle size (standard sieve analysis, 99.9% through 325 mesh); usable as a dry dust or slurry; LD_{50} (single oral dose toxicity) to rats, 0.63 g./kg. Uses: for control of seed decay and pre-emergence damping off of peas, beets, bushbeans, lima beans, cucumbers, radishes, spinach, wheat (bunt), hybrid corn, and soybeans; as a soil fungicide for control of fungi. Available in research quantities for experimental use. Carbide and Carbon Chemicals Corp.

EXPERIMENTAL FUNGICIDE 640

A zinc copper chromate with the empirical formula $ZnO \cdot 4CuO \cdot CrO_3 \cdot xH_2O$; a yellow-green powder with fine particle size (standard sieve analysis, 99.9% through 325 mesh); useable as a dry dust or slurry; LD_{50} (single oral dose toxicity) to rats, 3.62 g./kg. Uses: for control of seed decay and pre-emergence damping off of peas, beets, bushbeans, lima beans, cucumbers, radishes spinach, wheat (bunt), hybrid corn, and soybeans; as a soil fungicide for control of fungi. Available in research quantities for experimental use. Carbide and Carbon Chemicals Corp.

EXPERIMENTAL HERBICIDE 1
(Sodium 2,4-Dichlorphenyl "Cellosolve"* Sulfate)

$Cl_2C_6H_3OC_2H_4OSO_3Na$. A stable non-volatile, light-colored, crystalline powder; M.P., 170°C.; sol. in distilled water, up to 25% by wt. @ room temperature; LD_{50} (single oral dose toxicity) to rats, 1.4 g./kg. Suggested uses: experimentally for pre-emergence weeding of any large-seeded crops, such as corn, beans, and potatoes, either in water solution or as a dust. Available in research quantities for experimental use. Carbide and Carbon Chemicals Corp.
*Trademark.

EXPERIMENTAL HERBICIDE 2

A complex organic compound, containing nitrogen and chlorine, for regulating plant growth; a white crystalline powder of micro-fine particle size; M.P. 197°C. with decomposition; insoluble in water and oil; slightly soluble in common organic solvents; low order of primary irritation on the skin, mucous membrane, and cornea of rabbits; single dose oral toxicity tests on rats revealed that none died or lost weight after a dosage of 31.6 g./kg. Suitable as a weed control chemical for pre-planting, pre-emergence, and post-emergence use on broad-leaved plants such as beets, carrots, onions, spinach, cotton, tomatoes, and potatoes. Available in research quantities for experimental use. Carbide and Carbon Chemicals Corp.

"FLEXOL"* PLASTICIZER 3CF
[Tri (2-chloroethyl) Phosphate]

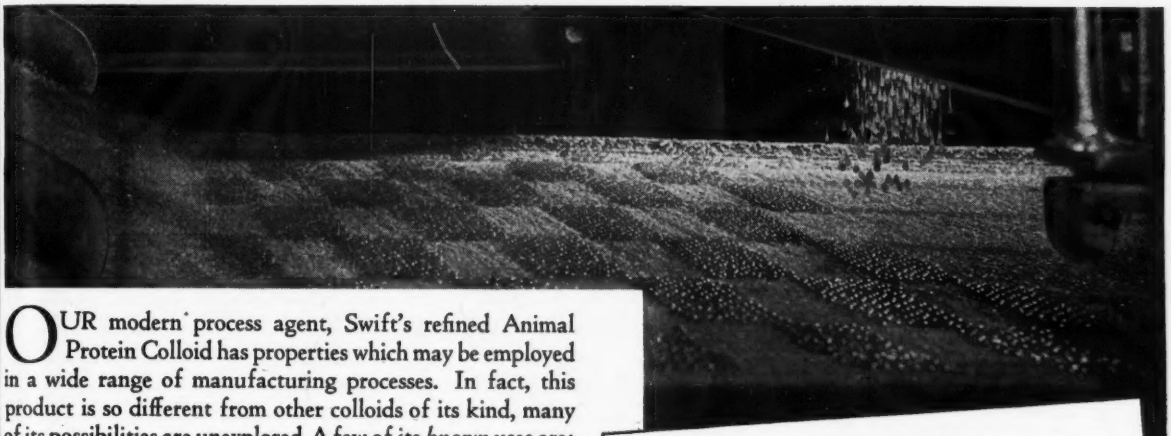
$(ClCH_2CH_2O)_3PO$. M.W., 285.51; Sp. G., 1.4283 @ 20/20°C.; B.P., 194°C. (5 mm.); F.P., sets to a glass below —45°C.; V.P., <0.01 mm. Hg. @ 20°C. and 7.0 mm. Hg at 200°C.; coefficient of expansion, 0.00137/°C.; viscosity, 45.3 cps. @ 20°C.; sol in water, 0.7% by wt. @ 20°C.; sol. of water in, 4.64% by wt. @ 20°C.; sol. in mineral oil, <0.7% by wt. @ 20°C.; sol. of mineral oil in, <0.3% by wt. @ 20°C. Uses: Flame resistant plasticizer primarily for cellulose acetate; also useful with nitrocellulose, polystyrene, chlorinated rubber, and some vinyl and acrylate resins; of special interest for rubber compounds that require resistance to lubricating oils. Available in commercial quantities. Carbide and Carbon Chemicals Corp.
*Trademark.

"FLEXOL"* PLASTICIZER DHP
(di-n-Hexyl Phthalate)

$C_6H_4(COOC_6H_{13})_2$. M.W., 334.44; Sp. G., 1.0074 @ 20/20°C.; B.P., 220°C. (5 mm.); pour point. —58°C.; coefficient of expansion, 0.00077 @ 20°C.; viscosity, 29.5 cps. @ 20°C.; R.I., 1.4870 @ 20°C.; insoluble in water @ 20°C.; solubility of water in, .24% by wt. @ 20°C. Completely compatible with "Vinylite"* resin VYNW. Resembles "Flexol"* plasticizer DOP in most properties, but has stronger solvent action at elevated temperatures. Of principal interest as an auxiliary plasticizer for vinyl resins to increase calendering and extrusion speed and to promote fast fusion of dispersions. Suggested uses: in calendered film and sheeting; in organosols and plastisols. Available in commercial quantities. Carbide and Carbon Chemicals Corp.
*Trademark.

You tell us! *What uses can be made of a process agent as clean as...*

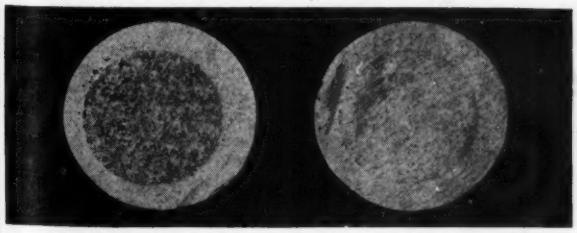
Swift's Animal Protein Colloid*?



OUR modern process agent, Swift's refined Animal Protein Colloid has properties which may be employed in a wide range of manufacturing processes. In fact, this product is so different from other colloids of its kind, many of its possibilities are unexplored. A few of its *known* uses are:

1. An emulsifier
2. A flotation agent
3. A gel structure
4. A settling agent
5. A protective coating
6. A sizing agent
7. A carrier of pigments
8. An impregnating agent
9. A base for pigments
10. An oilproofing agent
11. A flocculating agent
12. A clarifying agent
13. A filtering agent
14. A stiffening agent
15. A mordant
16. An adhesive

...but there may be many *others* of equal value!



Here a filter test indicates the relative cleanliness of this new process agent. Left: Ordinary commercial grade bone glue. Right: Swift's Animal Protein Colloid.

Try it for yourself. We invite you to test the possibilities of Swift's Animal Protein Colloid. It may meet your present requirements or help you to develop new products or more efficient processes.

For further information about Swift's Animal Protein Colloid write: →

What is this modern process agent?

Swift's Animal Protein Colloid is made by an exclusive Swift process. This process makes possible the production of high quality protein colloid of unusual uniformity in particle size and composition.

In a spotless modern plant, protein liquor falls on a bed of dry finished product (see photograph) which adheres evenly to the droplets. By continuous schedule, under precise control every second, these droplets are dried, milled and screened.

During this almost automatic operation, the product has no contact with materials which could contaminate it with foreign substances.

As a result, Swift's Animal Protein Colloid is a clean, finely ground powder (light amber in color) which goes into solution rapidly.

Swift & Company

Adhesive Products Department

4109 Packers Avenue

Chicago 9, Illinois

FLUOROSOL ACL

Slightly yellowish white powder. Sparingly soluble in water. A whitening agent for cotton, rayon and vegetable fibers in general. "Methods of Application" bulletin available. Available in commercial quantities. National Aniline Division, Allied Chemical and Dye Corp.

G-251

A surface active, cationic germicide, of high bactericidal potency. A quaternary ammonium compound of the morpholinium alkyl sulfate series. G-251 is compatible with a wide range of detergent builders and organic sequestering and dispersing agents. Stable in boiling mineral acids and alkalies of high concentrations. Preliminary toxicological data indicates a much lower toxicity index than other known commercial quaternaries. G-251 possesses a mild odor, is light tan in color and is supplied in a 35% solution. Commercially available. Atlas Powder Co.

G-362

A solid polyester resin, which can be easily ground to a non-blocking powder of any desired mesh size. Melting range 105-115°C. Exhibits a wide range of compatibility with vinyl compounds such as styrene, diallyl phthalate, vinyl acetate, etc. Suggested use: For laminating, bonding and impregnating compositions. Copolymers employing G-362 exhibit excellent electrical properties. Its powdered form makes it particularly suitable for use in filled low-pressure molding compounds. Available in pilot quantities. Atlas Powder Co.

G-1629

Aryl ether of a polyglycol which is an almost water-white liquid of mild odor; Sp. G. 1.043 @ 25°/25°C.; Viscosity 31 cp. @ 25°; R. I. 1.500 @ 25°; Initial B. Pt. 150°C. @ 10 mm.; slightly soluble in water, very soluble in aliphatic and aromatic hydrocarbons, ketones, ethers, alcohols and esters; compatible with cellulose esters and ethers; a good solvent for cellulose acetate. Suggested uses: as a plasticizer for all types of cellulose derivatives in film and molding applications. Molded articles are light in color and have high impact strength and hardness and good dimensional stability. Commercially available. Atlas Powder Co.

G-1680

Aryl ether of a polyglycol which is an almost water-white liquid of mild odor; Sp. G. 1.040 @ 25°/25°C.; Viscosity 120 cp. @ 25°; R. I. 1.509 @ 25°; Initial B. P. 180°C. @ 10 mm; very slightly soluble in water, very soluble in aliphatic and aromatic hydrocarbons, ketones, ethers, alcohols and esters; compatible with cellulose esters and ethers; a fairly good solvent for cellulose acetate. Suggested uses: as a plasticizer for all types of cellulose derivatives in film and molding applications. Molded articles are light in color and have high impact strength and hardness and excellent dimensional stability. Commercially available. Atlas Powder Co.

G-1692

Aryl ether of a polyglycol which is an almost water-white liquid of mild odor; Sp. G. 1.110 @ 25°/25°C.; Viscosity 37 cp. @ 25°, R. I. 1.520 @ 25°; Initial B. Pt. 165°C. @ 10 mm.; slightly soluble in water, insoluble in aliphatic hydrocarbons, slightly soluble in ethers and vegetable oils; soluble in aromatic hydrocarbons, ketones, alcohols and lower aliphatic esters; compatible with cellulose esters and ethers; an excellent solvent for cellulose acetate. Suggested uses: as a plasticizer for all types of cellulose derivatives in film and molding applications. Molded articles are light in color and have high impact strength and hardness. Films containing this plasticizer do not accumulate static charge. Commercially available. Atlas Powder Co.

G-1725

A non-ionic emulsifier derived from beeswax and resembling it in form. Differs from beeswax in that it is self-dispersible in warm water and it can be used as the sole emulsifier in the preparation of soap-free cold creams, emollient creams, all-purpose creams, hair dressings, and similar emulsions. If desired, borax or other alkali may be used as a co-emulsifier in conjunction with G-1725 with or without added beeswax. Atlas Powder Co.

GM-30

A pregelatinized wheat starch which forms a paste when mixed with cold water. Used primarily as a high grade cereal binder for foundry molding cores, has high green strength and, in plant trials, has shown excellent permeability, green deformation, toughness and flowability. Also shows promise as a binder in packaged fuel, pottery products and in sausage and other foods. Commercially available. General Mills, Inc.

GREASEPROOF COATING No. 1083-24

Vinyl dispersion (organosol type) for paper that can be fused at 300°F. to form a continuous coating. Film deposited is neutral and has excellent grease and oil resistance at low coating weights. American Resinous Chemicals Corp.

#168 GRIPTEX

A liquid rubber plastic compound for rugs and carpets. Makes rugs skidproof, prevents fraying. Excellent for filling in tufts and patches and attaching fringes. Strengthens rugs weakened by mildew or dry rot. Withstands washing and dry cleaning. Commercially available. Adhesive Products Corp.

#1558 GRIPTEX TILE CEMENT

A white rubber base mastic suitable for adhering ceramic, glass, metal and plastic tiles to plaster, concrete, or sheet rock walls. Waterproof, flexible. Adhesive Products Corp.

I. G. WAX L

The L type is quite similar to the S. However, it is a harder wax and has not been bleached as light in color; M.P., 176-181°F.; acid value, 127-129; ester value, 22-37; sap. value, 155-170; unsap. matter, 7-10%; Sp. G., 0.99-1.00 @ 20°C.; color, yellow. Of particular interest where fatty acids from natural fats do not meet the specifications regarding hardness. Commercially available. George H. Lincks, Inc.

I. G. WAX S

A bleached, deresinized Montan wax; M.P., 176-181°F.; acid value, 142-157; ester value, 10-30; sap. value, 160-175; unsap. matter, 7-10%; Sp. G., 1.01-1.02 @ 20°C.; color, light yellow. Outstanding in its ability to dissolve color bases. Produces soap-like combinations with alkalies and has an exceptional hardening effect upon softer waxes. Advantageously used in the carbon paper, candle and polish industries. Commercially available. George H. Lincks, Inc.

I. G. WAXES O AND OP

Exceptionally high melting point, high molecular ester waxes derived from I. G. Wax S; M.P., 216-223°F.; acid value, 10-15; ester value, 103-120; sap. value, 110-132; unsap. matter, 5-8%; Sp. G., 1.03-1.04 @ 20°C., color light brown. Both have outstanding properties of binding large quantities of organic solvents and oils, surpassing by far, that quality of any natural wax. Highly recommended for all types of paste polishes, leather dressings and similar products where durable, high-luster films are desired. Commercially available. George H. Lincks, Inc.

I. G. WAX E

An ester of I. G. Wax S; M.P., 174-180°F.; acid value, 17-25; ester value, 140-156; sap. value, 158-178; unsap. matter, 5-8%; Sp. G., 1.01-1.02 @ 20°C.; color, light yellow. Very easily emulsified and highly suited for all types of liquid polishes, producing a smooth polish of high luster and durability. Commercially available. George H. Lincks, Inc.

I. G. WAXES KP AND KPS

Mixtures of bleached, deresinized and raw Montan waxes; M.P., 176-181°F.; acid value, 25-35; ester value, 100-120; sap. value, 130-145; unsap. matter, 12-14%; Sp. G. 1.02-1.03 @ 20°C.; color, KP—brown, KPS—yellow. Particularly hard but tough waxes due to the joint use of the bleached and raw Montans. Suited for the manufacture of carbon paper and bright drying emulsions such as floor wax preparations. Commercially available. George H. Lincks, Inc.

I. G. WAX CR

A mixture of an ester of I. G. Wax S and Montan wax; M.P., 176-181°F., acid value, 31-37; ester value, 84-98; sap. value, 115-130; unsap. matter, 13-16%; Sp. G., 1.00-1.01 @ 20°C.; color, black. Easily saponified and is highly suited for black or dark colored emulsions such as shoe creams. Commercially available. George H. Lincks, Inc.

I. G. WAX SPECIAL

A high content of Montan wax; M.P., 194-200°F.; acid value, 13-18; ester value, 80-90; sap. value, 95-110; unsap. matter, 20-22%; Sp. G., 1.00 @ 20°C.; color, black. Recommended for black or dark colored paste polishes, especially shoe polish, giving a firm binding resistent to variations of temperature and imparting a good surface. Commercially available. George H. Lincks, Inc.

"KETOSOL"* SOLVENTS 25 AND 75

Mixtures of acetophenone and phenyl methyl carbinol in approximately 75 to 25 and 25 to 75% by weight proportions, respectively. Physical properties are intermediate between those of the components: Sp. G., 1.030 (acetophenone) and 1.0150 (phenyl methyl carbinol) @ 20/20°C.; B.P., 201.7°C. and 203.9°C. (760 mm.); V.P., 0.30 and 0.01 mm. Hg @ 20°C.; R. I., 1.5363 and 1.5211 @ 20°C.; coefficient of expansion, 0.00084/°C. and 0.00080/°C. @ 20°C.; sol. in water, 0.55% by wt. and 2.3% by wt. @ 20°C.; sol. of water in, 1.65% by wt. and 5.9% by wt. @ 20°C. Both "Ketosol" solvents have freezing points between 8 and 11°C. Solvents for cellulose acetate-butyrate, cellulose acetate-propionate, "Vinylite"* resins AYAF, VYHH, and XYHL, dewaxed dammar, and ester gum "C"; soluble in linseed oil, rosin, toluene, and "Troluoil." Suggested uses: as a solvent for engine "varnishes," carburetor gums, and gums on gas appliances and meters; as a solvent for dyestuffs for textiles, inks, and shoe polishes; as a solvent for nitrocellulose and "Vinylite"* resin coatings; as an odorant for packaged soaps and detergents. Available in commercial quantities. Carbide and Carbon Chemicals Corp.
*Trademark.

LAMINATING ADHESIVE 720-47

Waterproof, durable, fast-setting adhesive for laminating aluminum, pliofilm, and cellulose acetate foils to paper. American Resinous Chemicals Corp.

LUCITE* HM-140

Heat-resistant acrylic resin molding powder, with improved molding properties and better color. Will enable molders to obtain the higher heat-resistance of previous "Lucite" HM-122 with the moldability of softer acrylics. In many instances, molding cycles will be shortened, the number of rejected pieces reduced, and more accurate molding made possible. Manufactured in a wide range of transparent, translucent, and opaque colors. Commercially available. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

LUPERSOL* FDM

A solution of methyl isobutyl ketone peroxide in dimethyl phthalate. Purity, 80% minimum; Active oxygen, 11% minimum; Flash Point (Cleveland open cup), Over 100°F.; A water-white liquid. Sp. G. at 25°C. of 0.98. Soluble in oxygenated organic solvents. Slightly soluble in petroleum solvents. Insoluble in water. Readily soluble in most synthetic resins and is a convenient non-viscous, liquid, low temperature catalyst for the polymerization of vinyl and polyester type resins. Useful in curing polyester resins at room temperature and, if desired, may be used with commercial promoter compounds in this application. Available in pilot plant quantities, samples on request. Lucidol Division, Novadel-Agene Corp.
*Trademark.

LUSTREX COPOLYMER DISPERSIONS X-640 SERIES
(Resin emulsions)

A series of internally plasticized copolymer emulsions comprising 40% solids, stable to repeated cycles of freezing and thawing and unusually stable to mechanical agitation. These emulsions deposit clear, continuous, flexible, light stable, tough films. Suggested ingredient for leather, textile and paper coatings, specialty wash-prime coatings. Availability: Semi-commercial quantities. Monsanto Chemical Co.

LUSTREX LATEX X-601
(Resin emulsion)

An aqueous emulsion of unplasticized polystyrene comprising 50% solids, stable to repeated cycles of freezing and thawing and unusually stable to mechanical agitation. Suggested as an ingredient in the compounding of adhesives, coatings and floor waxes, de-lustering agent, resin impregnation and the bonding of fibrous and porous materials. Availability: Commercial quantities. Monsanto Chemical Co.

LUSTREX LT
(Injection molding material)

High-impact modified polystyrene for injection molding or extrusion. Notched Izod impact values are 2-4 times that developed by general purpose polystyrene. Colors limited to opaque. Availability: Commercial quantities. Monsanto Chemical Co.

LUSTREX X-800 SERIES
(Resins)

A series of copolymers soluble in aqueous alkali supplied in powder form. Solutions deposit clear, continuous, hard, heat-resistant films. Suggested for use as a thickening agent especially for latices and in the preparation of adhesives, specialty coatings and printing inks. Availability: Commercial quantities. Monsanto Chemical Co.

MAGIGRIP ALL PURPOSE ADHESIVE

A waterproof adhesive with plastic and rubber base for adhering rubber tile to concrete floors. Also suitable for adhering metal, glass, brick, marble, wood, plastic, mirrors, tile, cork and asbestos. Requires no heat or pressure. Commercially available. Adhesive Products Corp.

"MELSAN" FUNGICIDE AND BACTERICIDE

A balanced composition for the prevention of surface stain on freshly sawn lumber, based on ethyl mercury phosphate and sodium pentachlorophenate. Designed to effectively control both stain and mold-occurring organisms in one treatment. Will provide superior stain control in yards faced with exceptionally difficult air seasoning environment such as exists in regions of warm temperatures and high humidities where an excess of mist and fog retards rapid surface drying of the lumber. E. I. du Pont de Nemours & Co. (Inc.)

Detergents with WYANDOTTE CARBOSE*

give greater whiteness retention

***Specialized grades of Sodium CMC**

Wyandotte Carbose, when incorporated in soaps and synthetic detergents, improves not only soil removal but also whiteness retention. In effect, it suspends the soil it removes . . . keeps that soil from redepositing.

Qualities such as this enable Carbose to promote the detergency of "built" and "unbuilt" detergent products to a degree heretofore unobtainable.

Today, hundreds of commercial laundries are using products containing Carbose on all classes of lightly soiled and heavily soiled fabrics. The results have been outstanding. Fabrics are cleaner and brighter; soil redeposition is lower and washing time is reduced.

Carbose offers important advantages in other applications, as well — in the manufacture of water-base paints, paper, textiles and adhesives.

"Carbose" Reg. U. S. Pat. Off.

Wyandotte Chemicals Corporation
Wyandotte, Mich. • *Offices in Principal Cities*

• For complete data on this versatile compound, write for your free copy of our new 32-page booklet, "Wyandotte Carbose."

SODA ASH • CAUSTIC SODA
BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE
CHLORINE • HYDROGEN • DRY ICE
SYNTHETIC DETERGENTS • GLYCOLS
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE
PROPYLENE DICHLORIDE • CHLOROETHERS
AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

Wyandotte
REG. U. S. PAT. OFF.

MIDOPHATE

Free flowing white powder containing about 80% of an anionic sulfonate of a complex alcohol. Balance are salts of low molecular organic acids. Only a small amount of sodium sulfate—not more than 3%—is present. Moisture content less than 1% pH of a 1% solution 5.3-6.3. Clearly soluble in water. Surface tension of 0.1% solution: 35-36 dynes/cm. Commercially available. Emulsol Corp.

MONSANTO AE-1

An alcohol ester. M.W., app. 407; Light tan viscous liquid; insoluble in water, ethylene glycol, and methanol, slightly soluble in ethanol, soluble in other organic solvents. Suggested uses, as a solvent, as a plasticizer and as an intermediate where an inexpensive high molecular weight alcohol is indicated. Availability, experimental quantities. Monsanto Chemical Co.

MYVAX*
(Synthetic Vitamin A Concentrate)

A synthetic acetate ester; potency, 1 million U.S.P. units per gram; stability, vitamin A recovery—under conditions of complete aeration—of 75% or more after 17½ hrs. at 55°C.; color, reddish; sol. in usual fat solvents. Recommended for use where a high potency stable source of vitamin A having little or no taste is needed for products carrying the vitamin A in an oily medium. Commercially available in limited quantities. Eastman Kodak Co.
*Trademark.

MYVAX*-16
(Synthetic Vitamin A Concentrate)

A synthetic palmitate ester; potency, 700,000 U.S.P. units per gram; stability, vitamin A recovery—under conditions of complete aeration—of 75% or more after 17½ hrs. at 55°C.; color, reddish; sol. in usual fat solvents. Recommended for use in oily mediums and in preparations containing water. Commercially available in limited quantities. Eastman Kodak Co.
*Trademark.

MYVEROL* 18-85
(Monoglycerides)

Distilled monoglycerides of cottonseed oil; M. P., 52°C., 125.6°F. approx.; plastic fat; sap. val., 155-160; iodine val., 75-85; S. G., 0.9637 at 60°C.; sol. in most org. solvents. Useful in baking industry because of its surface-active and emulsifying properties. Commercially available. Eastman Kodak Co.
*Trademark.

NEUFUME DMH

A paste which is readily dispersible in warm water, developed for use in the dye bath for application to acetate fabrics to inhibit atmospheric gas fading. Availability: Commercial. Onyx Oil & Chemical Co.

NEUTRONYX 600

A liquid non-ionic polyglycol ether which has excellent wetting, foaming, and detergent action. Compatible with cationic or anionic agents; applicable in acid and alkaline media and in hard water. Availability: Commercial. Onyx Oil & Chemical Co.

NEVILLE LX-685

A heat-reactive thermoplastic synthetic resin; various melting points from 115 to 180°C; color, light amber; acid number, under 2; saponification number 0; iodine number 100; soluble in aliphatic, aromatic and chlorinated solvents. Excellent for use in inks, light-colored floor tile, adhesives and rubber compounding. Ideal for low-cost oleo-resinous vehicles where it imparts excellent drying qualities as well as superior reagent resistance. Available commercially. The Neville Co.

NEVILLE LX-695

A dark, odorless, non-reactive thermoplastic hydrocarbon resin; melting point range 70-100° C., ash-free, neutral and soluble in aromatic and high solvency aliphatic solvents. Excellent for use as an extender and low cost binder in inks, floor tile, adhesives, insulating compounds, automobile undercoatings, rubber goods and protective coatings. Commercially available. The Neville Co.

NIAGARA FAST COPPER BLUE EG

A new, non-dusting, direct blue yielding, on cotton or rayon, bright, reddish shades of blue. When after-treated with copper the shades become somewhat greener and duller but their light fastness is vastly increased. Possesses good solubility and is unaffected by Monel or copper and dulled but slightly by iron. It has good affinity for pure silk or tin-weighted silk; very good affinity for rayon and yields very good unions on cotton-rayon materials. National Aniline Division, Allied Chemical & Dye Corp.

NONIC 218

Polyethylene glycol tert-dodecylthioether; non-ionic surface active agent. Color, straw; physical form, liquid; Sp.G. @ 20°/20°C., 1.05; viscosity at 77°F., 1.33 poises; av. wt. per gallon, 8.5 lbs. Uses: Detergent, wetting agent, emulsifier and in combination with other surface active materials. Available in commercial quantities. Sharples Chemicals, Inc.

NONIONIC #2534

Nonionic surface-active agent containing 98% minimum active material. Straw-colored liquid containing no turbidity or suspended matter. Excellent wetting properties and low foam. Available in pilot plant quantities. Sharples Chemicals, Inc.

NOPCO* 1219-A

100% active blend of sulfonated and esterified oils. Has a high emulsifying and solubilizing potential for chlorinated insecticides of the benzene hexachloride, Chlordane and toxaphene types. Moisture: nil; Odor: mild; pH 2% solution 6.8-7.0; Sp.G.: 1.003; Solubility: Clearly soluble in all petroleum materials, in toluene and xylene; Miscibility: Miscible with short chain alcohols and water. Either stable emulsions or clear solutions in water may be obtained depending on proportions of Nopco 1219-A used. Commercially available. Nopco Chemical Co.
*Trademark

NOPALCOL* 10-DLO

Liquid buffing compound base. Has unusual merit for polishing precious metals as well as ferrous types. Color: hazy amber liquid; Moisture: nil; pH 2% solution 4.5. Produces opalescent aqueous emulsions. User adds water and abrasive to obtain viscosity and abrasive qualities desired. Commercially available. Nopco Chemical Co.
*Trademark

NOPCOCIDE K

Dodecylacetamido dimethyl benzyl ammonium chloride. 100% active. Appearance: white crystalline solid; M.P.: 142° C.; Solubility: completely soluble in water up to a concentration of 45%. Has high germ killing power over a variety of organisms. As little as 1 part to 20,000/30,000 parts of water will kill bacteria in 10 minutes. Stable to heat and pH change without loss of germicidal power. Commercially available. Nopco Chemical Co.

NOPCO* ESI

A nonionic aqueous dispersion of an insoluble metallic soap. Color: semifluid, white paste; Moisture 55.0%. Primarily used as an additive for clay coating formulations. Other specialty applications are in manufacture of matrix board and rubber sheeting. Commercially available. Nopco Chemical Co.
*Trademark

NOPCOGEN* 22-0

An oleic amine exhibiting cation-active characteristics. Highly suitable for demulsification of tars especially those resulting from carburetted water gas manufacture. Approximately one part Nopcogen 22-0 is employed for every 10,000 parts tar emulsion. Used alone or mixed with drip oil. Color: dark brown viscous liquid; Moisture: nil; Solubility: water insoluble. Commercially available. Nopco Chemical Co.
*Trademark

NOPCOLENE* F AND NOPCOLENE R

Two of a series of leather fatliquoring oils designed to impart varying degrees of softness, surface feel, hand, stretch, etc. Color: dark amber liquids; 100% active; moisture free; readily dispersible in water to produce opaque emulsions with a pH of 3.0-3.5. These products are chemical combinations of acid stable emulsifying agents and selected processed oils. Commercially available. Nopco Chemical Co.
*Trademark

NOPCO* SIZE V

A modified polyvinyl acetate resin emulsion. This fluid emulsion is suitable for treatment of textiles, paper and other articles where a surface coating is desirable to increase stiffness. Color: dense, white fluid; Solids: 50%; Sp.G.: 1.07; Heat sealing temperature: 145°C.; pH 5% solution: 4.5. Available in semi-commercial quantities. Nopco Chemical Co.
*Trademark

NU-FAB FABRIC PAINT

Available in 11 colors and black and white. Improved formula makes streaking impossible. Recommended for convertible auto tops, outdoor furniture, umbrellas, cushions, awnings, tents, lamp shades. Flexible, waterproof. Commercially available. Adhesive Products Corp.

ONYXOL 9162

A fatty acid alkanolamine condensate possessing excellent wetting, foaming, and detergent characteristics. Particularly recommended for wool scouring and other textile processing operations. Availability: commercial. Onyx Oil & Chemical Co.

OVALCLENE*
(Dry Cleaning Detergent)

Clear amber liquid; Sp. G. 1.25 at 15°C. pH range 7.5-9.0. For use with synthetic and petroleum solvents in all types of dry cleaning equipment; also used as a prespotting fluid. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

PANAFLEX BN-1

A light-colored petroleum-derived hydrocarbon plasticizer for vinyl resins and synthetic rubbers. Particularly recommended for use with nitrile rubber as a partial or complete replacement for dibutyl phthalate. Can be used as a secondary plasticizer in vinyl chloride formulations with dioctyl phthalate. Produces good physical properties, and improves water and oil resistance. Outstanding in its ability to impart superior electrical properties to stocks. Availability: commercial quantities, tank cars or drums. Pan American Refining Corp.

PANAPOL 2C

A light-colored petroleum-derived hydrocarbon drying oil. Sp.G. @ 15.6/15.6°C., 0.9/25; Gardner Color, 14; Iodine Number, 200; Refractive Index @ 25 nD, 1.5410; Gardner-Holdt Viscosity, U-V; Acid Number, negligible; Saponification Number, zero. Serves as a general linseed oil replacement or modifying component. Improves brushability, leveling properties, gloss, hardness and water and chemical resistance of paints and enamels. Reduces skinning. Compatible with most drying and non-drying oils, natural resins and synthetic resins such as modified and oil soluble phenolics, alkyds, terpenes, hydrocarbon and synthetic and chlorinated rubber. In the field of printing inks, particularly applicable for use in lithographic varnishes, letterpress and offset inks. Availability: commercial quantities, tank cars or drums. Pan American Refining Corp.

PANAPOL X-5

An exceptionally light-colored hydrocarbon drying oil. Sp.G. @ 15.6/15.6°C., O.983; Gardner Color, 9; Iodine Number, 65; Molecular Weight, 380; Refractive Index @ 25 nD, 1.5430; Gardner-Holdt Viscosity, Z4; Non-Volatile, 98.0%; Acid Number, negligible; Saponification Number, zero; Flash Point, 210°F.; Pour Point, 50°F. Compatible with most drying and non-drying oils, natural and synthetic resins and plasticizers. Recommended for use with vegetable drying oils to improve hardness, abrasion and chemical resistance in oleoresinous paints and enamels. Can be employed to advantage in alkyd enamels and rubber paints. Applicable for use in lithographic varnishes, letterpress and offset inks. Availability: pilot-plant quantities. Pan American Refining Corp.

PANAREZ 6-210

A synthetic oxidizing-type hydrocarbon resin derived from petroleum. Sp.G. @ 15.6/15.6°C., 1.106; Color, 3; Iodine No., 180; Softening Point, 210°F.; Acid No., negligible; Saponification Number, 1. Dries by both polymerization and oxidization. Compatible with most drying oils, natural and synthetic resins and rubbers. Soluble in aromatic and aliphatic hydrocarbons. Improves water, chemical and abrasion resistance of finishes when employed in paints and varnishes. Produces sanitary can coatings of excellent hardness, flexibility and durability. Availability: commercial quantities, tank cars or drums. Pan American Refining Corp.

PARNOL

An alkyl aryl sulfonate, especially sodium salt of doedcyl toluene sulfonate; active matter 41% plus. A spray-dried, free-flowing, white powder with little or no odor, stable in usual acid and alkali solutions; has exceptional wetting properties and high detergent powers. Jacques Wolf & Co.

PARZATE* LIQUID FUNGICIDE

A vegetable and ornamental fungicide containing 19% disodium ethylene bisdithiocarbamate in water solution which, when combined with zinc sulfate in the spray tank, produces zinc ethylene bisdithiocarbamate. Can be used effectively and safely with the insecticides that are commonly used on crop plants. Particularly adapted for control of many of the costly diseases of potatoes, tomatoes, celery, cucurbits, azaleas, camellias and gladiolus. Available in commercial quantities. E. I. du Pont de Nemours & Co (Inc.)
*Trademark

PEPTIZENE-2

Thiol benzoic anhydride on an inert carrier. $(C_6H_5CO)_2S$. M.W. 242. The active principle is an oily crystalline solid. M.P. 48°C. Suggest-

NOTES FROM THE ... NUCHAR

purification notebook

TREATMENT OF BEER

Maturing is one of the fundamental operations in brew making, and although the true nature of the reaction is not completely and thoroughly understood, it is regarded as a necessary step in the production of a quality beer. The aging process accomplishes a settling out of yeast cells, and a removal of protective colloids responsible for haze formation during shelf storage of the finished product. Aging is also responsible for the flavor, mellowness, sparkle and foam characteristics of the beer.

Aging is accomplished in large storage units called Ruh tanks. In these tanks, the brew from the fermenters comes to rest for a period varying from seven to twenty or more days. During the summer months, when beer consumption reaches a peak, the brew is aged as rapidly as possible to allow for maximum production. Any acceleration of the aging process during this period is of considerable importance to the brewer.

It has been found that the aging of beer can be greatly accelerated by the presence of small quantities of NUCHAR—probably because of a catalytic action. The application of NUCHAR is simple and does not require any additional equipment. One and one-half to three pounds of NUCHAR C-190-N per one hundred barrels of beer is added directly to the brew as it enters the Ruh tank. The carbon evidently remains in suspension long enough to accomplish its purpose.

After storage is completed, the beer containing the carbon in suspension is filtered through a pre-coated filter. A slurry diatomaceous earth (or POLYCEL—a cellulosic filteraid) is fed along with the beer during filtration to provide a suitable press cake.

The first filtrate through the press is recirculated back to the Ruh tank. When the filtrate becomes clear, the beer is directed to the finishing tanks where it is ready for a final pulp filtration and subsequent bottling. One NUCHAR user reports that maturity is reached within ten to twelve days, compared to the usual thirty days aging time.

In addition to application in the Ruh tanks, it has been indicated that one and one-half to three pounds of NUCHAR C-190-N per hundred barrels of wort in the mash tub is also helpful in producing a more satisfactory quality beer.

Samples of NUCHAR for test purposes are available on request.

industrial CHEMICAL SALES

division west virginia pulp and paper company

SALES OFFICES

New York Central Bldg. 230 Park Avenue New York 17, N. Y.	Pure Oil Bldg. 35 E. Wacker Drive Chicago 1, Illinois	Public Ledger Bldg. Independence Square Philadelphia 6, Pa.	Leader Bldg. 526 Superior Ave., N.W. Cleveland 14, Ohio

OTHER PRODUCTS

SNOW TOP PRECIPITATED CALCIUM CARBONATE ● LIQRO CRUDE TALL OIL
INDUSOIL DISTILLED TALL OIL ● TALLENE TALL OIL PITCH ● TALLEX ABIETIC ACID
SULFATE WOOD TURPENTINE ● ALPHA PINENE ● BETA PINENE ● POLYCEL CELLULOSE FIBERS
INDULIN (LIGNIN)

ed for use in the softening of rubber. Availability: Semi-commercial quantities. Monsanto Chemical Co.

PERSAMBRENE*

An aromatic chemical characteristic of the Ambrene-Opoponax type perfume bases. An amber colored liquid readily soluble in all essential oils and alcohol. Full and mellow and highly satisfactory as a base by itself or wherever an accentuation of the oriental background of a perfume is desired. Commercial quantities. Dow Chemical Co.
*Trademark.

PHI-O-SOL WP

A wetting agent of the sulfonated fatty acid ester type recommended especially for applications where low-foaming is desirable. Availability: Commercial. Onyx Oil & Chemical Co.

PLASTICIZER C-989

A low cost plasticizr for vinyl acetate and synthetic rubber. Ash, Nil; Sp.G., 1.067; Acid value, 0.4; Saponification value, 29; Flash Point, 355°F; Color in Lovibond units, 25 Red, 28 Yellow; Distillation, 0% 183°C., 10% 189°C., 20% 203°C., 30% 212°C., 40% 218°C. Stahl Finish Co.

#437 PLASTIC SEAL

A synthetic rubber mastic recommended for sealing glass reflector beads in plastic housings. Dries hard but not brittle. Does not attack plastic, mirror, or lacquer coatings. Can be extruded or trowelled. Commercially available. Adhesive Products Corp.

PLASTOFLEX VS

A peptizing plasticizer for stabilizers in vinyl resins. Has a higher boiling point than DOP and is more efficient than DOP in low temperature work. Particularly useful with phosphate plasticizers to diminish their light discoloration. Advance Solvents & Chemical Corp.

PLUSH BACKSIZE 1079-45F

A low cost curing type latex emulsion possessing high pile binding strength at low coating weights. Pile fabrics backed with this number have a natural soft handle, excellent aging properties and good laundry resistance. American Resinous Chemicals Corp.

POLVATE C

A synthetic drying oil, Gardner-Holt viscosity X-Z, Color 15-17, Acid No. 19 and Flash Point 400°F (A.S.T.M. D-92-46). Suggested for use as a core oil, linseed oil extender for linoleum, printing ink and surface coating formulations. Availability: Semi-commercial quantities. Monsanto Chemical Co.

POLYCIN 785

Non-flowing, tacky, amber-colored castor oil gel with good alkali resistance. Plasticizer for rubbers (natural and synthetic) and resins (cumars, asphalts, etc.); impregnant; caulking ingredient. Baker Castor Oil Co.

POLYCO COLD BOND (199)

A ready-to-use, quick grab, cold synthetic resin wood glue. Concentration 55%; Weight per gallon 9 lbs. Suggested uses: store fixtures; table tops-formica type; kitchen cabinets; sash and doors; caskets; chairs; tables; wood pattern shops; manual training schools; boxes, silver chests; pencils. Commercially available. For sale to adhesive manufacturers and distributors only. American Polymer Corp.

POLYCO 319

A free-flowing acrylic copolymer dispersion characterized by an exceptionally fine particle size. Deposits a continuous, tough, clear, elastomeric, waterproof film with good low temperature flexibility. Absence of plasticizer or oxidizable components results in excellent aging and weathering characteristics. Concentration 40%; pH 4-5, also available with pH 7-8 and in hard and soft grades; Viscosity 5-10 cps. Suggested uses: Pigment binder for leather finishing; Emulsion paint base; Paper impregnant; Binder for clays, pigments, talc in weighting finishes; Sizes for all types of fabrics. Commercially available. American Polymer Corp.

POLYCO 337XS

A stable aqueous resin dispersion specifically formulated to impart a permanent launder and dry cleaning finish to textiles, particularly cottons. Concentration 40%; pH 4-5; Viscosity water thin. Suggested uses: To increase retention of stiffness through repeated launderings; To prevent discoloration on exposure to light; To increase abrasion and wear resistance and increase fabric strength; To impart resistance to soiling; To impart luxurious handle and surface finish. Commercially available. American Polymer Corp.

POLYCO 350
(Synthetic Latex)

A stabilized dispersion of a high styrene content copolymer. Concentration 45%; pH 8.5-9.5; Viscosity 20 cps. at 25°C.; Brookfield Viscosimeter No. 1 spindle at 60 RPM. Suggested uses: Paper coatings, laminants and saturants; Textile and leather finishes; A reinforcing agent for other synthetic latices; Water paints. Commercially available. American Polymer Corp.

POLYCO 836-24

Fine particle size polyvinyl acetate copolymer emulsion, in which the particle size is of particular interest where the emulsion is to be diluted to a low solids content since the settling rate is among the lowest of any commercial polyvinyl acetate emulsion available. Deposits clear continuous film. Concentration 45%; pH 4-5; Viscosity 200 cps. at 25°C. Suggested uses: laminant; adhesive (both for wet combining and heat sealing); coating, saturant, textile size and binder, where color, strength, toughness and resistance to oxidation, heat, light, bacteria and age are desirable; Wash resistant permanent stiffening finish for cotton and rayon. Commercially available. American Polymer Corp.

POLYCO 1065-34

Polyvinyl acetate emulsion with ultra-high viscosity of 100,000 cps. This viscosity is obtained by the process of polymerizing and not by the addition of thickening agents. Concentration 55%; Viscosity 100,000 cps. Useful where extremely high body is required. Commercially available. American Polymer Corp.

PONSOL* OLIVE T PASTE

An anthraquinone vat dye for cotton and viscose-process rayon. Produces neutral olive shades with excellent fastness to light. Recommended especially for military fabrics, industrial uniforms, work clothing and other materials that may encounter severe treatment during wear and washing. Shows good fastness to crocking, moist pressing, water spotting, laundering with Chlorine, washing and dry cleaning. Applied by the usual vat dyeing methods and is especially suitable for use in the Du Pont pad-steam continuous dyeing process. Reduces readily to a black vat, penetrates thoroughly, levels well and has a very good exhaust. The metals normally encountered in dyeing equipment have a negligible effect on the shade. Soaping, however, changes the shade appreciably greener. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

PONTAMINE* DIAZO BORDEAUX RLN

A developed color which produces bright, bordeaux shades on both viscose-process rayon and cotton. Particularly suitable for white discharge work on these two fibers, and possesses very good resistance to perspiration, salt water, dry crocking, dry cleaning, coupled with good fastness to washing and cold water. The wash fastness on viscose-process rayon is slightly superior to that on cotton. Recommended as a base for maroon, burgundy, wine, and similar ground shades for discharge patterns on dress goods and other materials where good fastness to wet processing is important. Also suitable for acetate-white effects. Has good solubility, penetrates well, dyes levelly and can be applied in the usual types of equipment. It is normally coupled with beta napthol. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

PONTAMINE* DIAZO ORANGE N CONC.

A brilliant reddish-orange that can be discharged to a pure white on both cotton and viscose-process rayon. It possesses good resistance to crocking, hot moist pressing, steaming and cold water. Especially recommended as a base for brown and tan ground shades for discharge patterns on dress goods and is equally suitable for shading reds and scarlets. Readily soluble, penetrates and levels well. Unaffected by metals and can be applied to all forms of cotton and viscose-process rayon by the usual methods. Stains nylon noticeably, dyes silk and wool and is of special interest for producing acetate white effects in cotton-acetate unions. Normally coupled with beta napthol. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

PONTAMINE* FAST BROWN 8RL

An excellent fast-to-light direct dye for producing shades of bright reddish-brown on both cotton and viscose-process rayon. Has good fastness to dry cleaning and dry crocking and possesses fairly good resistance to perspiration, hot moist pressing and moist crocking. Because of its very good light fastness it is especially useful for the production of the deeper brown shades on draperies, curtains and similar materials and is recommended as a reddening element for taupe shades on automotive upholstery fabrics. Is readily soluble, penetrates and levels well. Can be applied in the customary types of dyeing equipment. In multi-fiber work, dyes rayon, silk and wool, stains nylon considerably and noticeably stains acetate. Also suitable for shading cotton in cotton-wool unions. Crush-proofing treatments applied to dyed cotton change the shade redder and weaker and decrease the light fastness. When these treatments are applied to rayon the shade becomes considerably redder and weaker and the fastness to light is also lowered. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

PORCELAIN ENAMELS FOR ALUMINUM

Vitreous enamels for application on 43 or 61-S aluminum alloys. Enamels have superior impact and flex resistance and resistance to thermal shock. Enameled aluminum may be cut with a hacksaw and, to a limited degree, bent in the field. May be formulated to give a very wide range of colors. E. I. du Pont de Nemours & Co. (Inc.)

POWDER BASE #901

Comb. ZnO, 13.5-14.0%. Moisture Content 0.2-0.5%. Bulk Average 145-150 fl. oz./lb. White powder; M.P., 110-115°C.; 100% thru 200 mesh. No odor. Insoluble in water, lower alcohols, esters, chlorinated solvents, mineral spirits, mineral oil, waxes, benzol, toluol and xylol. Use: All forms of cosmetic manufacturing. Available in commercial quantities. Arnold Hoffman & Co., Inc.

PUFFING AGENT (APA)

A synthetic organic product which has been found beneficial in producing a marked viscosity increase in paints and varnishes. In most cases, from 1% to 3% by volume of APA, based on the paint, has been found to produce the viscosity desired. Fully soluble and compatible with most paints and varnishes. Its effect on bodying is immediate, and is not progressive. After the bodying action has taken place the paint does not continue to thicken. The puffing or bodying effect has been found to be permanent and the paint does not lose its viscosity on aging. The viscosity obtained is uniform throughout the paint or varnish. Advance Solvents & Chemical Corp.

RESIN EMULSION 1071-6C

Clear, tough, permanently flexible resin. Currently used for gloss paper coating both clear and pigmented. Also used as emulsion floor wax addend to improve wearing and anti-slip qualities. American Resinous Chemicals Corp.

RESONET 402

A vinyl polymer dispersion intended as a delustrant for bright yarns and fabrics; imparts no hand. May also be used in conjunction with other Resonets to add weight without imparting stiffness. Commercially available. E. F. Houghton & Co.

RESONET 403

A modified vinyl polymer of high molecular weight, applied to fabrics (diluted about 1 to 5 lbs. per 100 lbs. of water) to produce a crisp starchy finish. Commercially available. E. F. Houghton & Co.

RESONET 422

A water dispersion of a modified vinyl copolymer. Applied by padding and drying and produces an extremely soft hand, adding fullness without stiffening. Commercially available. E. F. Houghton & Co.

ROSOTTONE*

An aromatic chemical which closely resembles Otto of Rose. A light amber colored liquid, soluble in all essential oils and alcohol. Highly satisfactory as a substitute for the natural Otto. Commercial quantities. Dow Chemical Co.
*Trademark.

RSW-11

White cold water insoluble modified starch of food quality derived from waxy maize. Higher than normal gelatinization point which can be controlled within limits at the time of manufacture to fit customers needs. The paste will show a steady increase in viscosity over a long cooking period. Excellent colloidal stability is obtained and there is no tendency to gel. Paste prepared from mixtures of RSW-11 and other starches show greatly improved colloidal stability. More stable when cooked in the presence of aqueous organic or mineral acids than is common starch and maintains good viscosity under these conditions. Sp.G. about 0.6. Available commercially. Shipping units 100 lb. paper bags. Samples available on request. American Maize-Products Co.

SANTICIZER 142*

An alkyl, aryl phosphate ester; clear, practically colorless liquid; B.P. approx. 280°C. at 20 mm.; Sp.Gr. 1.07 at 25°/25°C.; refr. index 1.51 at 25°C. Miscible with practically all organic solvents. Suggested as an efficient, permanent,

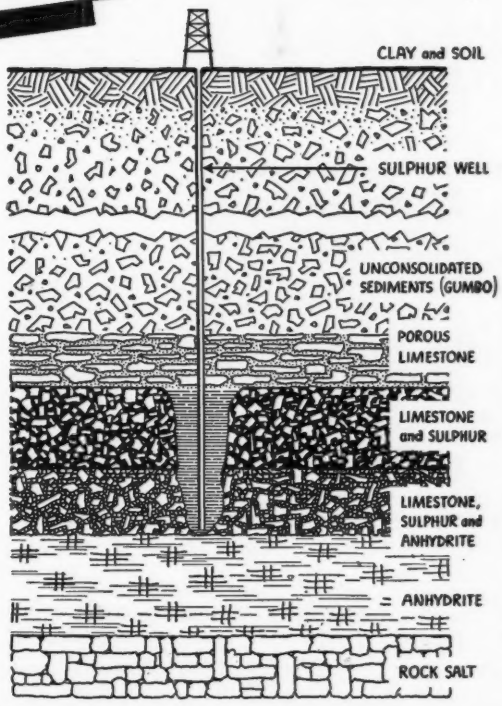
SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*DEPOSITS . . .

Practically all of the elemental sulphur used in this country comes from mines in Louisiana and Texas.

There, the sulphur deposits occur in the cap rock overlying certain salt domes. The sulphur is mined at depths of 300 to 2,000 feet below the surface. It is melted in place by pumping into the deposit water heated under pressure to a temperature above the melting point of sulphur. The melted sulphur flows away from the limestone and is pumped to the surface where it is allowed to solidify in vats. By such means sulphur nearly 100% pure is produced.



Loading operations at one of the huge vats of Sulphur at our Newgulf, Texas mine. Such mountains of Sulphur are constantly being built at our mines, from which shipments are continually made.

TEXAS GULF SULPHUR CO. INC.

75 East 45th St. New York 17, N. Y.

Mines: Newgulf and Moss Bluff, Texas

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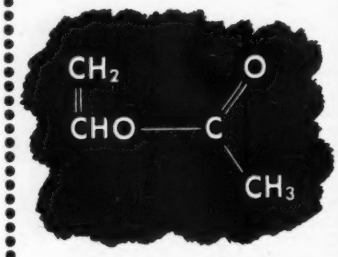
UNPOLYMERIZED VINYL ACETATE

(STABILIZED)



BOILING RANGE
71.8° to 73°C.

Vinyl Acetate can be polymerized to form resins with exceptional bonding qualities for wood, glass, metal and fibre.

Vinyl Acetate can be used for synthesis of a-b-dichloroethyl acetate, b-monochlor ethyl acetate, b-chloro acetals, 2-aminothiazole, chloroacetaldehyde and many others.

***Containers:* —**

410 lb. drums

62,500 lb. tank cars

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CHEMICALS DIVISION
UNITED STATES VANADIUM CORPORATION
Unit of Union Carbide and Carbon Corporation

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flame retardant plasticizer for synthetic resins—particularly polyvinyl chloride and copolymer vinyl chloride-acetate types. Available in commercial quantities. Monsanto Chemical Co.
*Trademark

SANTOMERSE BW
(Wetting Agent)

$NaSO_3C_6H_4COOC_{12}H_{25}$. M.W., 392. Pale yellow powder. Food grade product. Suggested uses: Use in dentifrices and other applications requiring high purity. Availability: Experimental quantities. Monsanto Chemical Co.

SELLOGEN 0-230

A synthetic tanning compound from phenol condensates used as substitute for natural tanning extract producing good weight, full plump leather, and white color. Jacques Wolf & Co.

SEQUESTRENE NA2

Technically pure disodium ethylenediamine tetraacetate dihydrate; sol. in water: 10%; pH-5.0; Suggested uses: deionizing agent for alkali earths and metals; for counteracting trace metal effects; analytical reagent; antioxidant; clarifier. Commercially available. Alrose Chemical Co.

SEQUESTRENE NA3

Technically pure trisodium ethylene diamine tetraacetate; soluble in water; pH-8.0; suggested uses: deionizing agent for alkali earths and metals; for counteracting trace metal effects; detergency and foam builder for stearate soaps; polymerization activator. Commercially available. Alrose Chemical Co.

SKYDROL*

Clear, mobile, light green, ester-based liquid. Non-toxic. Viscosity: 2256 centistokes at —30°F. and 15 centistokes at 100°F. ASTM pour point below —60°F. Autogenous ignition temperature (ASTM): 1050°F. Viscosity index: 160. Highly stable to heat and oxygen; stable in presence of concentrated hydrogen peroxide. Suggested as flame-resistant, non-toxic hydraulic fluid and lubricant. Literature: Skydrol Bulletin. Available in commercial quantities. Monsanto Chemical Co.
*Trademark

90% SODIUM TCA WEED KILLER

A grass-type weed-killer containing 90% sodium trichloroacetate with a trichloroacetic acid equivalent of 79.3% (approximately 12 ounces per pound of product). The water-soluble compound is usually employed as a spray with at least one gallon of water for each pound of 90% Sodium TCA Weed Killer. Recommended for control of certain noxious grasses, such as Johnson, Bermuda and quack grasses in local infestations of crop lands (spot treatments) and for general use on non-crop lands, such as fence rows, ditchbanks, right-of-ways, etc. May be used with 2,4-D weed killers to extend the range of weeds controlled. Available in commercial quantities. E. I. du Pont de Nemours & Co. (Inc.)

SOLANTINE BLUE GREEN FWL

A non-dusting, direct green of excellent fastness to light. Possesses excellent solubility and level dyeing properties yielding, on cotton or rayon, bluish green shades of good fastness to perspiration, water, sea-water and rubbing and excellent fastness to acids, alkalies and light. Stains wool and silk but leaves acetate rayon clear. It is readily dischargeable. National Aniline Division, Allied Chemical & Dye Corp.

SOLANTINE BROWN 8RL

A non-dusting direct brown producing a very reddish, rather bright brown shade of excellent fastness to light, alkali I and organic acid and good fastness to perspiration, sea water, water, rubbing and hot pressing. Possesses good solubility and is but little affected by metals. Has excellent affinity for rayon, when dyeing at 180°F., and yields excellent unions on cotton-rayon materials. Silk effects are slightly stained but acetate rayon is left clear. National Aniline Division, Allied Chemical & Dye Corp.

SOLVOTERGE 50

A solvent soluble detergent recommended primarily for dry-cleaning in chlorinated solvents; suggested also for metal cleaning. Commercially available. Alrose Chemical Co.

SOLVOTERGE 160

A solvent soluble detergent; 85% active; recommended primarily for dry-cleaning in stoddard solvent; also suggested for spotting formulations, detergent lubricants, metal cleaning. Commercially available. Alrose Chemical Co.

SOROLENE

An improved wetting agent of the sulfonated alkyl naphthalene type. Produced in both paste and powder forms. Active in acid solution. Availability: commercial. Onyx Oil & Chemical Co.

SPIRIT SOLUBLE FAST GREEN B

An alcohol soluble dye. Possesses very good solubility in Carbitol, Cellosolve and Methyl Cellosolve. Yields yellowish green shades of good fastness to light and to bleeding in water. Non-dusting. A companion product to the other National spirit soluble fast dyes for use in wood stains. National Aniline Division, Allied Chemical & Dye Corp.

STABILIZER 1071-4D

2% stabilizer added to GRS latex or compounded GRS latices makes the resulting compound mechanically stable without affecting the rubber film. American Resinous Chemicals Corp.

STABILIZER 6162

A 50% solution in benzol of the sodium salt of an organic phosphate. A clear, nearly colorless liquid. Sp.G. (25°C.) of 1.015; Viscosity about 8 c.p. P_2O_5 content, 8.3%. The solute is an extremely viscous and tacky material and is best handled by reducing its viscosity with solvents such as benzol. The salt has the unusual property of being insoluble in water but soluble in hydrocarbons and most organic solvents. Modifications are available in which the solvent is xylol or dioctyl phthalate. Recommended for use as a stabilizer for vinyl plastic films to prevent discoloration caused by light. Available in commercial quantities. Victor Chemical Works.

STEROX No. 5

Polyoxyethylene thioether. Non-ionic wetting agent and detergent. Clear, straw colored liquid. Suggested uses: Washing compound, cleanser for glass surfaces, scouring agent for degreasing sheepskin. Availability: Commercial quantities. Monsanto Chemical Co.

STEROX No. 6

Polyoxyethylene thioether. Non-ionic wetting agent and detergent. Clear, straw colored liquid. Suggested uses: Wetting agent and re-wetter in the textile field, scouring agent for woolens and piece goods. Availability: Commercial quantities. Monsanto Chemical Co.

STEROX DNK

A white free-flowing powder. Suggested use: De-inking of paper. Availability: Semi-commercial quantities. Monsanto Chemical Co.

#546 STIX ADHESIVE

A self curing plastic adhesive for laminating plastic sheets (such as Consoweld, Resylite, and Formica) to plywood for table tops. Also suitable for adhering laminated plastics to walls and store fronts. Eliminates need for clamps and presses. Makes possible on-the-job installations of sink tops and counter tops. Commercially available. Adhesive Products Corp.

STYMER S
(Textile Size)

Sodium salt of a synthetic resin: light amber powder, 100% through 20 mesh. Used for sizing synthetic fibers, especially acetate. Forms a tough, flexible protective film on fiber; reduces static troubles; does not gel in size box and pipes. Availability: Commercial quantities. Monsanto Chemical Co.

SULFANOLE FAA
(Detergent)

An amine salt of an alkyl sulfate. Clear, amber colored oily liquid. Completely miscible with water. pH of 5% aqueous solution is 7.0 to 9.0. Produces voluminous and stable froth at low concentrations even in the presence of oily soil. Excellent hard surface detergency. Recommended for preparation of liquid dishwashing compounds, window cleaners, rug shampoos, etc. Warwick Chemical Co.

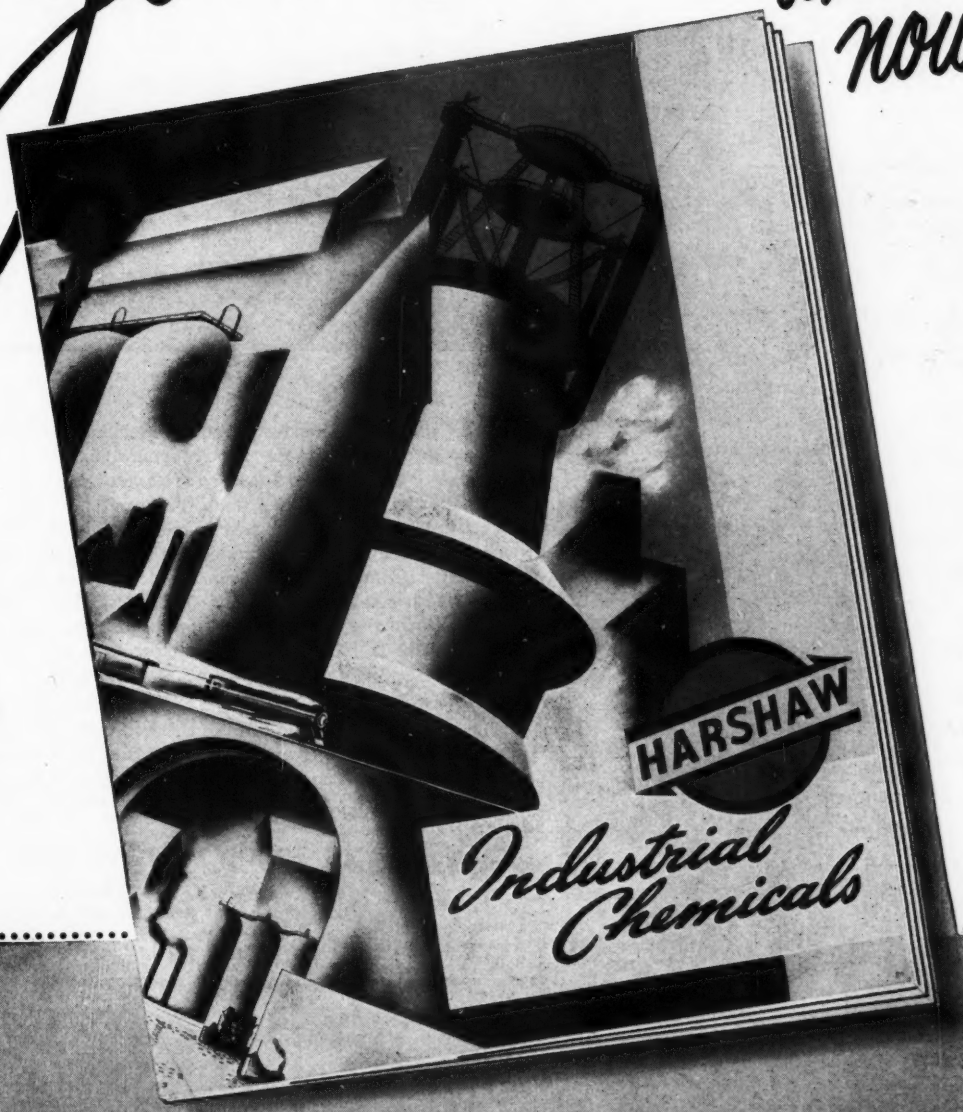
SULFANOLE FAD
(Detergent)

Sodium salt of fatty alcohol sulfate. Amber colored, slightly turbid, viscous liquid. Slight odor of fatty alcohol. Miscible with water. pH of 5% solution is 7.0 to 9.0. Excellent detergent and frothing agent. Recommended as a base for cosmetic preparations such as creme-shampoos, bubble baths, etc. Warwick Chemical Co.

SULFANOLE NF
(Detergent)

Fatty acid polyethyleneglycol ester incorporated in synergistic builders. Faintly yellowish powder with pleasant odor. Non-foaming detergent which has unsurpassed soil removal properties on cotton. Recommended for heavy duty cleaning on all fabrics. Particularly effective where sudsing interferes with optimum cleaning such as in automatic washing machines. Very useful for the removal of graphite from nylon lace. Warwick Chemical Co.

Yours FOR THE ASKING... write now!



This 32-page book alphabetically lists all chemicals available through Harshaw, relates the history of the Company and describes Harshaw's major activities. Write for a copy.

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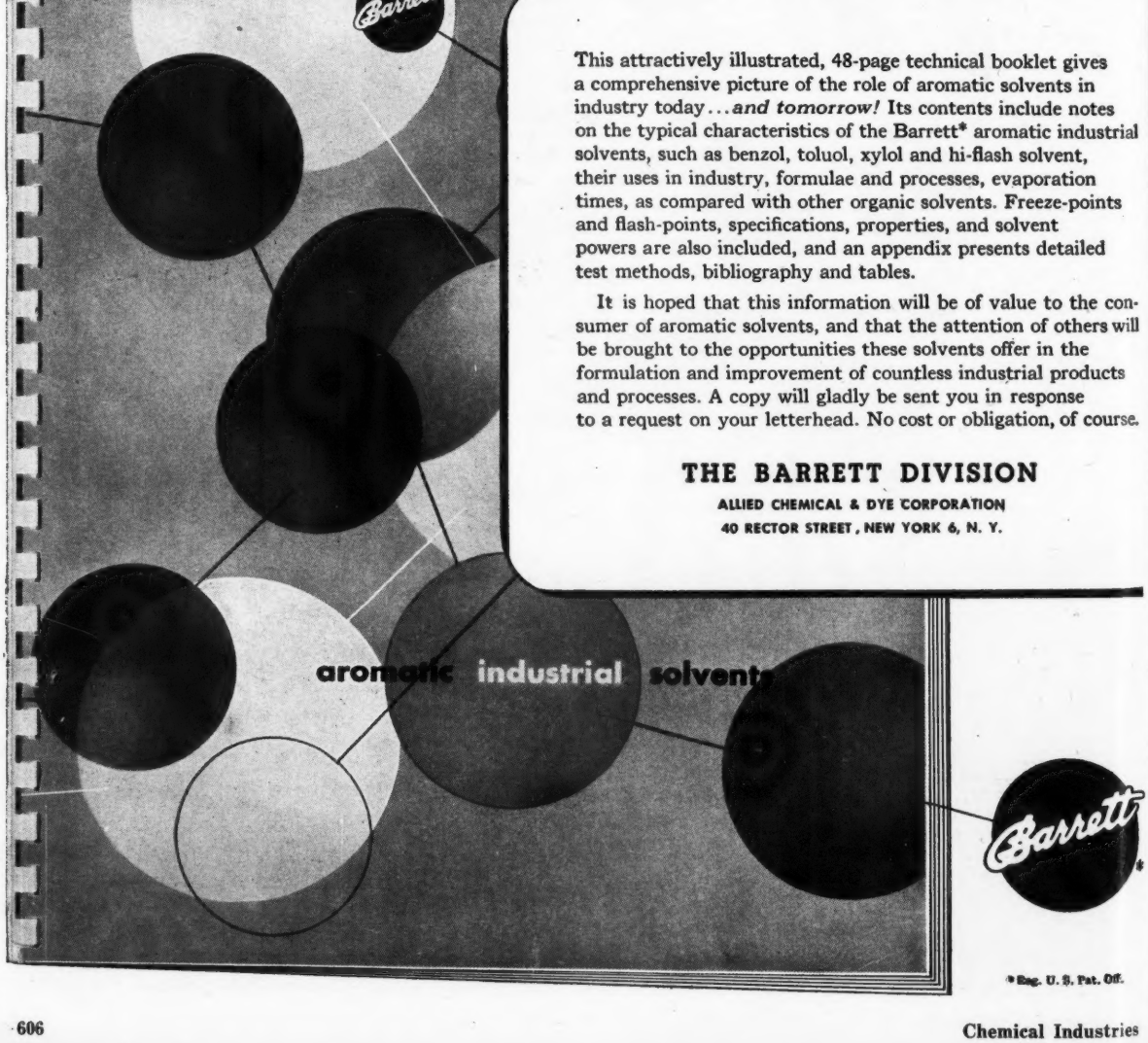

This attractively illustrated, 48-page technical booklet gives a comprehensive picture of the role of aromatic solvents in industry today... *and tomorrow!* Its contents include notes on the typical characteristics of the Barrett* aromatic industrial solvents, such as benzol, toluol, xylol and hi-flash solvent, their uses in industry, formulae and processes, evaporation times, as compared with other organic solvents. Freeze-points and flash-points, specifications, properties, and solvent powers are also included, and an appendix presents detailed test methods, bibliography and tables.

It is hoped that this information will be of value to the consumer of aromatic solvents, and that the attention of others will be brought to the opportunities these solvents offer in the formulation and improvement of countless industrial products and processes. A copy will gladly be sent you in response to a request on your letterhead. No cost or obligation, of course.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

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SYNTERGENT* G

A synergistic blend of anionic-nonionic liquid detergents. Suitable for all types of detergent application through a wide pH range. Color: clear-amber liquid; Active ingredients: 25%; pH 2% solution: 8.0. Commercially available. Nopco Chemical Co.
*Trademark

SYNTHETIC BEESWAX

Acid no., 20; Ester no. 73; saponification no., 93; Ratio, 3.6; M.P. 63°C.-145°F. Does not contain paraffin, soap, etc. Samples available. International Wax Refining Corp.

TACKIFIER 1041-21

Resin emulsion tackifier for natural rubber latex. When blended equally, the resulting adhesive deposits a strong, dry tack for a minimum 72 hours. Film has good strength and rub-off properties. Tackifiers and modifiers are also available for GRS and Neoprene latices. American Resinous Chemicals Corp.

TEFLON* (TETRAFLUOROETHYLENE RESIN) SUSPENSIONS

Stable aqueous dispersions of polytetrafluoroethylene which make this remarkably inert and high-softening polymer available in more convenient form for fabrication. These suspensoids are hydrophobic colloids with negatively charged particles, and contain small amounts of a wetting agent to increase their stability. pH is normally about 2-3. Viscosity about 5-10 centipoises at room temperature at 50-60% concentration of solids. Sp. G. at 25°C., 1.24 (35% solids), 1.50 (60% solids). Experimental quantities, containing from 35% to 60% of dispersed solids, available for development use. E. I. du Pont de Nemours & Co. (Inc.)
*Trademark

TENOX II

A new composition to retard oxidative rancidity. Combination of butylated hydroxy anisole, propyl gallate, and citric acid dissolved in propylene glycol especially formulated for the convenient processing of lard. Lard stabilized with Tenox II not only is itself protected from rancidity, but imparts to baked or fried foods equal protection. Available in commercial quantities. Tennessee Eastman Corp.

TENOX BHA

Eastman butylated hydroxy anisole, food inhibitor grade. A waxy white solid, soluble in all common animal and vegetable fats and oils. Present in the permissible 0.02 per cent concentration, it confers on animal fats, such as lard, a remarkable anti-rancidity stability which carries over into products made from the lard. When small concentrations (0.002 per cent) of a synergist such as citric acid are combined with Tenox BHA the stabilizing effect is materially increased. Particularly recommended for use in such products as citrus oils, vitamin oils, and animal fats. Available in commercial quantities. Tennessee Eastman Corp.

"TERGITOL"* DISPERSANT TMN-650

A non-ionic surface-active agent weighing about 8.3 lbs. per gallon and containing 100% active ingredient. At normal temperature, semi-gelatinous in form and completely dispersible in water. Stable toward acids and alkalies and compatible with anionic, cationic, or other non-ionic surface-active agents. Used at low concentrations, efficient as a general wetting agent and as an emulsifier for water-insoluble liquids. At 1-2%, it may be used as a lime-soap dispersant in shampoos, cleaning compounds, 2,4-D formulations, and with soap in hard water. Suggested uses: boiler feed-water treatment; latex emulsifier; pigment dispersant in protein paints; crude petroleum emulsion breaker; textile dyeing assistant; and coal-dust wetting agent. Available in semi-commercial quantities. Carbide and Carbon Chemicals Corp.
*Trademark

TRANOX* CLEANING COMPOSITION

A patented, specially formulated, heavy-duty, acid-type industrial cleaner based on oxalic acid and selected synthetic detergents. pH at 5% dilution is 1-2. A tan paste which can be used at full strength or in water solution at any desired concentration. Is particularly effective in removing iron oxide, dirt, carbon, oils and grease from acid resistant ceramic and enameled surfaces. In general can be used in all cleaning operations where oxalic acid is ordinarily used. Specific applications are the exterior cleaning of railroad passenger cars and the vitreous enamel surfaces of sanitary equipment. E. I. du Pont de Nemours & Co. (Inc.)
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A Polyvinyl Acetate Emulsion with these advantages

"Elvacet" emulsion . . . contains colorless, odorless, non-yellowing resin; excellent aging and light-fastness.

Easily applied—requires no costly or flammable solvents.

Uniformly dispersed in water.

Wide latitude in compounding with starches, dextrins, gums, waxes, many synthetic resins, chlorinated rubber, rubber latex and other common types of extenders, pigments and plasticizers.

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Adhesives and binders for: Cellophane, paper, cardboard, cloth, felt, straw, wood, cork, leather, metal, metal foil, mica, sand, ceramics.

Grease-proof coatings on paper or other materials . . . or grease-resistant sizes.

Rubber latex replacements and modifiers.

Textile finishes: fabric stiffeners, coatings; laminations; hat sizes.

Carriers for insecticides.

For more information about "Elvacet," help in its use for a specific application, samples, etc., send the coupon below. E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Dept., Wilmington 98, Delaware.

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INDOPOL H-300

a highly viscous, non-drying, light colored synthetic hydrocarbon product

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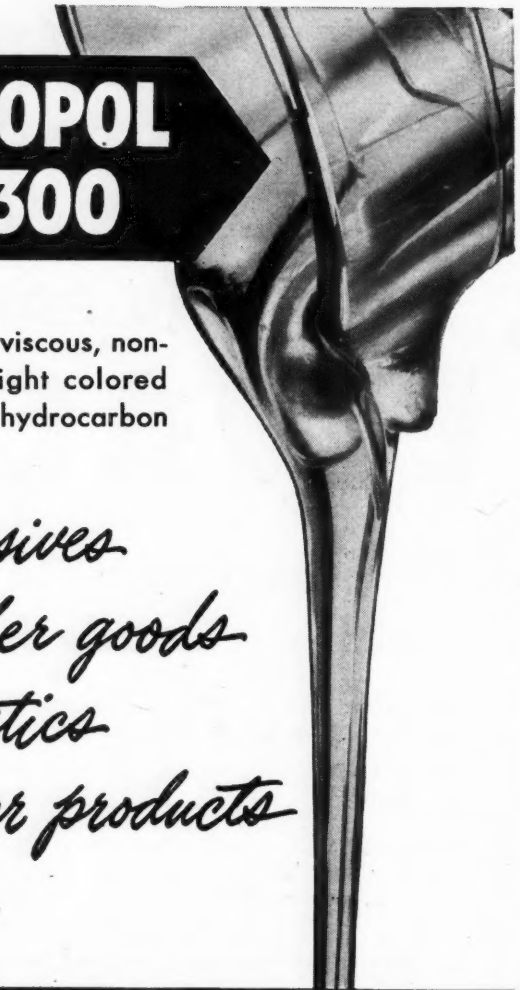

Available in seven grades

Brand Name	Indopol L-100	Indopol H-35	Indopol H-100	Indopol H-300
Viscosity 210° F., Saybolt sec.	93.8	377	1040	3000
Specific gravity 60°/60° F.....	.854	.871	.881	.894
Color, NPA	2	2	2	3
Pour Point (ASTM) °F.....	—25	0	20	35

Additional grades, and their Saybolt viscosities at 210° F., are L-10 (40.6 sec.), L-50 (68.2 sec.) and H-50 (540 sec.).

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910 South Michigan Avenue
Chicago 80, Illinois

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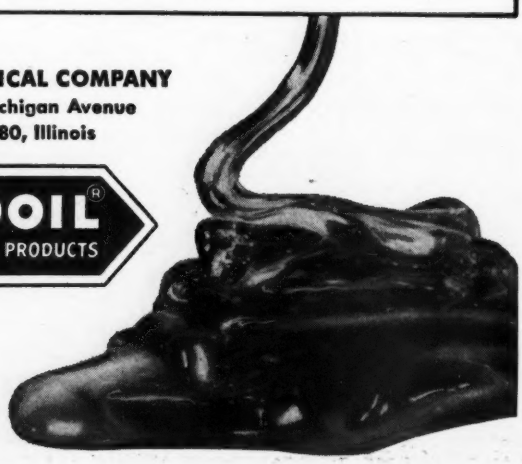


including: toughness; inherent flexibility; high elongation and elastic recovery; excellent resistance to most solvents including both aliphatic and aromatic hydrocarbons and to alkalies, ozone, and oxygen-containing gases. Impermeable to water and to inert gases but will pass water vapor. Can be thermoset under proper conditions to give alcohol-insoluble, essentially infusible products which retain their flexibility and the other desirable mechanical properties of the original polymers. Suggested for use in coatings, adhesives, moldings and extrusions, particularly for applications in which toughness, flexibility and hydrocarbon resistance are important. Commercially available. E. I. du Pont de Nemours & Co. (Inc.)

ULTRAWET 60L

Organic alkyl aryl sulfonate. Amber colored, crystal clear, viscous liquid with exceptional water solubility remaining clear below 20°F. Solution composed of 60% active and 40% water. Excellent foam, detergency, wetting speed and surface tension reduction. Suggested applications: household and institutional liquid detergents, textile detergent and wetting agent, fire-fighting, cosmetic formulations and emulsion polymerization. Available in commercial quantities. The Atlantic Refining Co.

VITAMIN B_{12} DRY CONCENTRATE (Vibalt*)

A dry concentrate of Vitamin B_{12} containing 350 mcg. per gram of vitamin B_{12} by microbiological assay. Believed to be the anti-pernicious anemia factor present in liver and is one of the most effective hemotopoietic agents known. A purified concentrate of this essential factor, obtained by fermentation methods. Use is indicated in the treatment of pernicious anemia, sprue, tropical sprue, nutritional macrocytic anemia and various other types of anemia. The dry concentrate is for manufacturing purposes only. Must be stored in a cool place. Uses: For pharmaceutical manufacturing purposes. Availability: Commercial. Chas. Pfizer & Co. Inc.
*Trademark.

VITAMIN B_{12} SOLUTION (Vibalt*)

A sterile, non-pyrogenic solution, each ml of which contains 15 micrograms (microbiological assay) of vitamin B_{12}, which is the most effective hematopoietic agent known. Believed to be a very important constituent of the animal protein factor and is one of the active components of liver extract. Produced by fermentation methods and purified. Use of the solution is indicated in treatment of pernicious anemia, sprue, nutritional macrocytic anemia and certain other types of macrocytic anemias. Must be stored in a cool place. Uses: Pharmaceutical. Availability: Commercial. Chas. Pfizer & Co., Inc.
*Trademark

VINYL ADHESIVE 848-16D

Clear, colorless solvent type adhesive for permanently adhering vinyl film to itself, leather, and fabric. American Resinous Chemicals Corp.

VINYL PRINTING INKS

For high speed rotogravure printing on unsupported vinyl film. Good adhesion, light-fastness and durability. Suitable for "color separation" printing. All colors available. American Resinous Chemicals Corp.

VINYL RESIN STABILIZER E6B

A non-metallic stabilizer that is in itself a powerful HCl absorber. When combined with metallic salt stabilizers it acts as a powerful peptizing agent to synergize their activity. Advance Solvents & Chemical Corp.

VINYL RESIN STABILIZER #3

An organic tin compound polymer in powder form. Extremely effective both as heat and light stabilizer for polyvinyl resins. Affords ultimate in clarity and brilliance in heavy extruded sections. Advance Solvents & Chemical Corp.

VINYL RESIN STABILIZER #21

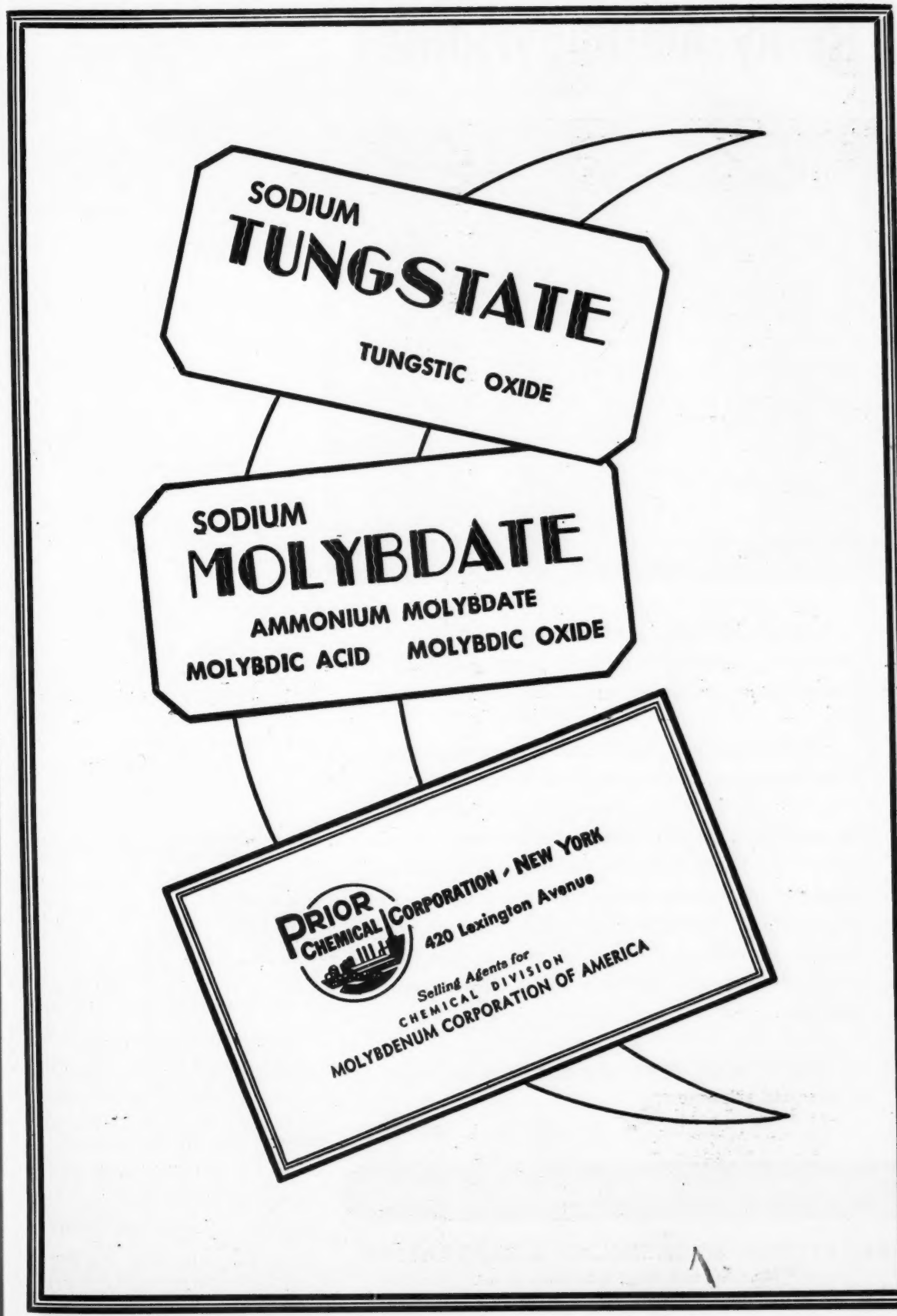
A cadmium type stabilizer; but is a radical departure from the usual cadmium fatty acid salts in that it has a molecule that is a powerful acceptor for hydrochloric acid, while at the same time it retains the action of cadmium compounds as stabilizing agents. Advance Solvents & Chemical Corp.

VINYL RESIN STABILIZER #52

A liquid tin-organic polymer, useable in same amounts as #3 for heat and light stabilization of vinyl resins. Extremely effective and also useable for premium grade transparency and brilliance. Advance Solvents & Chemical Corp.

"VOLAN" METHACRYLATO CHROMIC CHLORIDE

G-1050-M Methacrylato chromic chloride, a Werner type chromium complex used as an anchoring agent to improve the adhesive bond between polymeric coatings or impregnants and hydrophilic surfaces such as glass, cellulosic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Reilly Aminopyridines

	2-Aminopyridine	2,6-Diaminopyridine	2-Amino-3-Methylpyridine	2-Amino-4-Methylpyridine	2-Amino-5-Methylpyridine	2-Amino-6-Methylpyridine
Molecular Weight	94.06	109.08	108.08	108.08	108.08	108.08
Boiling Point at 760 m.m.	210.6°C	285°C	221.1°C	230.9°C	227.1°C	214.4°C
Freezing Point	58.1°C	120.8°C	33.3°C	99.0°C	76.6°C	43.7°C
Solubility (in 100 grams water @ 20°C)	More than 100 G.	9.9 G.	More than 100 G.	4.1 G.	More than 100 G.	More than 100 G.
SPECIFICATIONS						
Purity	98% min.	98% min.	95% min.	95% min.	95% min.	95% min.
Freezing Point	57.2°C min.	119.2°C min.	29.5°C min.	96.0°C min.	73.5°C min.	39.0°C min.

In keeping with its policy of making available to industry organic chemicals of potential usefulness, Reilly is now producing the six aminopyridines above described.

Perhaps the most important of these products is 2-Aminopyridine, parent compound in the synthesis of important antihistaminics, for relief in distressing allergic conditions, such as hay fever. All of these chemicals are of interest in the pharmaceutical field, and are suggested for investigation in the manufacture of disinfectants, insecticides, plastics, rubber chemicals, wetting agents, additives to lubricants and gasolines, photographic compounds, dyestuffs, and in various organic syntheses.

Further information on any of these products gladly furnished on request.

Reilly Coal Tar Chemicals For Industry

REILLY TAR & CHEMICAL CORPORATION

Merchants Bank Bldg., Indianapolis 4, Ind.

500 Fifth Avenue, New York 18 • 2513 S. Damen Avenue, Chicago 8

structures, (wood and paper), and polymeric materials; especially under moist conditions. Application is made from dilute aqueous solution by spraying, padding, or simple immersion. Supplied as a stable concentrate in isopropanol. Containers are 6-½ gallon glass carboys. E. I. du Pont de Nemours & Co. (Inc.)

WARCO GFI
(Gas Fading Inhibitor)

A high molecular weight polyamine contained in a self-emulsifiable base. Clear, brown colored thin gel; odor of xylol. Disperses in water to form milky emulsions which are stable even a the boil. Provides excellent gas fading protection for dyed acetate fabrics. The protection is unaffected by washing or dry cleaning. Warwick Chemical Co.

WARCOSOL NF
(Wetting Agent)

A sulfonated polyester. A clear straw-colored thin liquid with mild alcoholic odor. Completely miscible with water. pH of 5% solution is 7.0 to 9.0. Good wetting agent with a minimum amount of sudsing. Particularly effective in solutions which contain 0.5% to 2.0% of caustic soda, and is well suited as a wetting agent in the application of vat dye-stuffs and as a back-wetting agent in vat pigment-pad processes. Warwick Chemical Co.

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A milky white adhesive for woodworking. Dries transparent. Leaves no glue lines. Requires no heat. Fast setting, water resistant. Recommended for furniture, kitchen cabinets, art work, hobbies. Commercially available. Adhesive Products Corp.

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A clear, viscous solution of a water-soluble ammonium salt of a thermoplastic resin. Recommended as a stiffening agent for synthetic fabrics. Availability: Commercial. Onyx Oil & Chemical Co.

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A clear, viscous solution of a water-soluble sodium salt of a thermoplastic resin. Suggested as a textile stiffener and adheisive. Availability: Commercial. Onyx Oil & Chemical Co.

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A clear, slightly viscous solution of a water soluble resin recommended as a ribbon finish to impart body and stiffness to silks and acetates. Availability: Commercial. Onyx Oil & Chemical Co.

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Alrose Chemical Co., Box 1294, Providence 1, R. I.
Amend Drug and Chemical Co., 117-119 East 24 St., New York 10, N. Y.
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Atlantic Refining Co., 260 South Broad St., Philadelphia 1, Pa.
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Baker Castor Oil Co., 40 Avenue A, Bayonne, N. J.
Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J.
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NEW PRODUCTS & PROCESSES

Trifluoracetic Acid

New fluoro-compound is a strong organic acid, interesting intermediate for synthesis.

Research-size samples of a reactive fluorochemical are offered for sale by Minnesota Mining and Manufacturing Co., St. Paul 6, Minn.

The compound is CF_3COOH—trifluoroacetic acid—a colorless, corrosive liquid that is one of the strongest organic acids known. It is the first in a group of fluorinated acids to be offered by the 3M company. Samples and literature are available on request.

The acid has a strong pungent odor, boils at 71.1°C at 734 mm, and freezes at —15.3°C.

It is a chemical intermediate that may prove useful in the preparation of such products as dyes, pharmaceuticals, resins and plastics. It will undergo most of the usual organic reactions of ordinary acetic acid. Presence of the fluorine atoms contained in the fluorochemical enhances the flame resistance of compounds made from it.

The new fluorochemical, made in the company's pilot plant in St. Paul by an electrochemical process, is available in experimental quantities at $10 per pound.

Casting Material

Improved formulation gives improved water resistance, greater strength, and longer working life.

"Calcerite-A", developed by the research department of Furane Plastics and Chemicals Co., 719 West Broadway, Glendale, Calif., is a casting composition employing substantially amino-resins as binders. Its unique properties hold promise of finding wide acceptance among processors of plastics materials. While the material is furnished as an opaque white powder, it may be colored by various dyes and pigments to achieve attractive decorative effects. However, judging from early applications, it will find its greatest field of use in hard, durable tools and patterns for the machine shop, foundry and material fabrication processes.

"Calcerite-A" will supplement standard "Calcerite" manufactured by this concern, inasmuch as it will offer a much improved water resistance, greater strength, and longer working life. It is supplied as a freely flowing white powder to which is added an activator that will convert the powder to a heavy, though pourable, dough-like consistency.

Possessing a Barco hardness of 65-70, "Calcerite-A" is one of the hardest casting materials known, and when reinforced with glass flock fillers is capable of withstanding relatively high working temperatures. Another remarkable attribute of "Calcerite-A" is its ability to cure fully at room temperature without any complicated baking schedule. It may be cast in the wide variety of flexible molds now commercially available, to reproduce objects of many sizes and shapes.

"Calcerite-A" has excellent dimensional stability inasmuch as it will first expand to a slight degree, followed by a shrinkage that will return it to practically zero change in dimensions, from which no further change occurs. This dimensional stability is of extreme importance in dentures and precision tooling.

Acetate Dye

Tennessee Eastman introduces light-fast red acetate dye—first of a series.

The first of an entirely new family of dyes for cellulose acetate fibers—Eastone Red GLF—has been announced by Tennessee Eastman Corp. The new dye is said to be exceptionally fast to light even in pastel shades, and far surpasses any known acetate red in this respect. Other properties claimed for it include excellent fastness to gas fading, sublimation, crocking, and hot pressing, as well as very good fastness to perspiration and washing. Very good dischargeability is also reported.

Eastone Red GLF is a homogeneous, highly dispersed dye which produces a medium shade of red with a yellow cast. It possesses good exhaustion and level-dyeing characteristics with very good penetration and build-up at temperatures of from 160° F to 190° F. Information and samples of this new dye are obtainable from Tennessee Eastman Corporation, Kingsport, Tenn.

Ceramic Process

New process permits faster throughput, fewer molds in ceramic forming.

Dinnerware and artware processes have remained essentially unchanged in the ceramic industry for the past 50 to 100 years. Modernization has come in to the extent of making manual operations automatic, etc., but the basic principles of forming operations have been the same. In the fields of dinnerware and artware forming is done mainly by two methods: casting, in which a slurry of the clays and other materials is poured into plaster molds (the plaster absorbs the moisture from the slurry and the materials are solidified into shape); jiggering, in which the clay materials are made into a soft mud consistency and formed on a spinning mold of plaster by a contoured knife which forms the side away from the mold.

In both of these processes, a plurality of molds is required and the formed shape is left in the mold until it has dried enough to be handled and passed on to other processes for finishing.

The new Ram process, developed by Ram, Inc., 720 United Artists Building, Detroit 26, Mich., fundamentally forms the shape by pressing the clay materials (in a soft mud consistency) in plaster molds. Moisture is forced into the porous mold under pressure, and the piece is dried in the pressing operation so that it can be handled immediately. A novel release method also releases the shape from the plaster mold so that the plurality of molds required in former methods is eliminated and forming is done with a single mold. The tremendous amount of accessories required with former methods such as driers, mold conveyors, mold handling equipment, etc., are all eliminated.

Synthetic Pyrethrin

U.S.I. introduces a pyrethrin analog for testing purposes.

Availability of the so-called synthetic pyrethrum, based on the LaForge synthesis disclosed by the Department of Agriculture in March, has been announced by U. S. Industrial Chemicals, Inc., 60 E. 42nd St., New York 17, N. Y.

The chemical, an allyl homolog of Cinerin I, is a practically exact duplication of one of the active principles of pyrethrum, of which U. S. Industrial Chemicals is the major importer. Its availability supplements the present limited supplies of natural pyrethrum and facilitates the current rapid expansion in the use of pyrethrum-type insecticides.

The indicated level of production of the synthetic material insures its immediate and constant availability for necessary experimental work which must be done before it can be introduced into insecticide formulations. He also revealed that company facilities were such that production could be expanded to whatever extent may be necessary to insure manufacture of the chemical for commercial usages as rapidly as they are developed.

The chemical is not a synthetic pyrethrum, but is practically a duplication of only one of the four active ingredients of pyrethrum. Its effectiveness, although practically equal to that of natural pyrethrins against some insects, shows wide variations in its use in the control of other insects. Any assumption that the new chemical is a synthetic duplication of natural pyrethrins and can be substituted for natural pyrethrins in existing formulas without extensive entomological and

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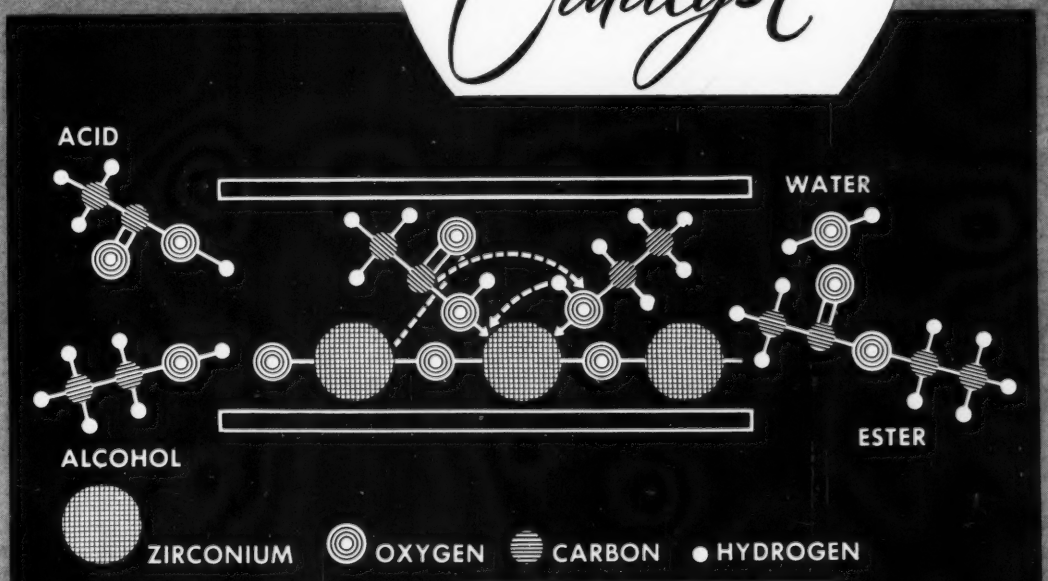

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More detailed information will be supplied upon request to our New York office where data on other TAM industrial chemicals also may be obtained.

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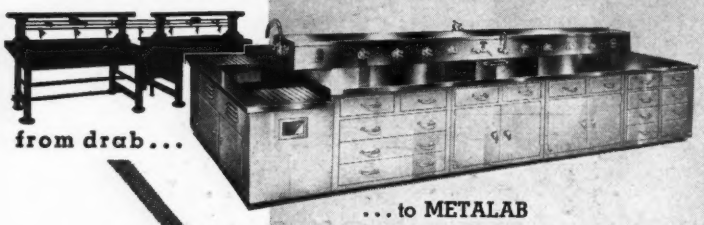

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possibly toxicological investigation appears to have little foundation in fact.

o-Dichlorobenzene Emulsifier

Newly-introduced emulsifier is designed for garbage-dump deodorization.

Orthemul is a non-corrosive emulsifier for orthodichlorobenzene. It is readily miscible in the cold with orthodichlorobenzene. A stable, clear concentrate may be prepared by using 80 gallons of orthodichlorobenzene and 20 gallons of Orthemul. 7.5 gallons of this concentrate will make an emulsion with 1,000 gallons of water ready for spraying on garbage dumps. This concentrate is used for the control of bacterial decomposition and putrefaction odors. It will not clog up nozzles.

The economy over sulfonated castor oil and other emulsifiers becomes evident at a price of 20c per pound in drum lots, drums inclusive, by Fine Organics, Inc., f.o.b. plant, Lodi, N. J.

Samples and quotation in larger quantities will be given by the office of Fine Organics, Inc., 211 East 19th Street, New York 3, N. Y.

• Sigma Chemical Co., 4648 Easton Avenue, St. Louis 13, Mo., has recently announced the commercial production of *phenolphthalein glucuronide*. This bio-synthetic preparation is vital in the study of glucuronidase activity in animals and man.

• Celanese Corp. of America, 180 Madison Ave., N. Y. C., is producing Lindol HF-X, a new, flame resistant tricresyl phosphate base *hydraulic fluid*. Since it is not a chlorinated compound, it does not give off noxious fumes when exposed to very high temperatures. Because of this feature, coupled with its non-burning property, high lubricity, corrosion resistance and low cost, Lindol HF-X is of particular interest.

DYES

(Continued from page 511)

dizing agent is used and two new intermediates that are used—ω-halo-*o*-xylene and ω-halo-*o*-tolunitrile.

Brilliant green pigments possessing excellent fastness to light are disclosed as aryl thioethers of phthalocyanine. These products are sulfonated to give bluish-green to yellow-green water-soluble dyes which are claimed to have great brilliancy and extraordinary fastness to light. New polyhydroxyalkylsulfonamide derivatives of phthalocyanine are water-soluble dyestuffs, characterized by brilliant blue to greenish shades, by excellent solubility and stability in caustic alkali solution, and by excellent fastness to light. Alcian Blue 8GS is covered by a patent describing water soluble phthalocyanines containing —CH_2X groups in which Xonium=sul-

fonium, isothiouronium and quaternary ammonium salts of water-soluble acids. A new phthalocyanine sulfur dye which dyes, by the standard sulfur dye methods, blue or green shades of good fastness properties has been disclosed.

A method of application has been patented which comprises the putting of phthalocyanine pigments on a titanium dioxide substrate to stabilize the pigments and obtain certain strength advantages.

FLUORESCENT DYES

Millson and Stearns gave an excellent review[20] on fluorescent dyes. The "white dyes" or brighteners have gone over very well. A superior one is disclosed[21] as a 4,4'-di- (*o*-alkoxybenzoyl) diaminostilbene-2,2'-disulfonic acid. A water-soluble derivative prepared by sulfonation of a benzimidazole has also been described.

Disulfonic acids of 4-amino-1,3-naphthalamides were disclosed as products which dyed wool a very brilliant yellow with strong fluorescence. A patent has been granted for producing a red fluorescence in cellulose acetate fibers by incorporating zinc sulfide in the fiber and coloring with a fluorescent dye, which is *p*-nitrobenzeneazo-4-methyl-2-dihydroxyethylaminobenzene.

NEW PRODUCTS

Actually new developments are scarce. A vat yellow fast to peroxide treatment and a metallized pink, both believed to be new, have been introduced. The trend is toward domestic manufacture of dyes previously imported. There is a bigger range of soluble vat dyes now available. Domestic manufacture has been increased. One trend to improve the fastness to wet processing of direct dyeings on viscose rayon is the use by aftertreatment of proprietary copper-containing organic compounds.

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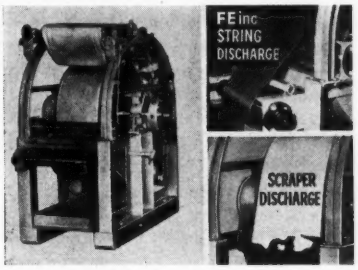
NEW EQUIPMENT

Rotary Filter

New pilot plant rotary filter has interchangeable string or scraper discharge.

The new pilot plant continuous rotary vacuum filter of Filtration Engineers, Inc., 155 Oraton St., Newark 4, N. J., is constructed of type 316 stainless steel. Both the FEinc string discharge and scraper discharge are provided. They are readily



interchanged when switching from one job to another.

The filter also includes the FEinc submergence type washing mechanism, which gives cleaner, dryer cake and better soluble recovery. It can be used for complete chemical washing, for compression drying only, or can be disconnected entirely. The new small filter has 3′ drum dia., 1′ drum width, approx. 10 ft². area. Filter cloth is Feon nylon or other material

Mixer

Counter-rotating mixer made available at laboratory mixing speeds for the first time.

By using two motors driving two concentric oppositely rotating shafts, propeller equipped, the new mixer of Brookfield Eng'r. Labs., Inc., Stoughton, Mass., produces an annular rather than circular flow. Thus, even the heavier particles, are rapidly drawn into the propellers where they must pass through the shearing zone. There is practically no cavitation, no centrifugal effect, and the liquid level remains essentially constant, allowing the use of nearly filled containers.

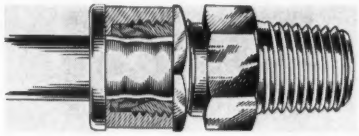
The Brookfield counter-rotating mixer allows relative speeds from approximately 200 to 12,000 rpm and provides a continuously variable speed control through a General Radio Variac which is mounted, together with an on-off switch on the support stand base.

The motors are completely enclosed for protection from corrosive fumes and all immersible parts are of type 302 stainless steel, except a bottom guide bearing of leaded bronze. It is available for either 110 or 220 volts, AC or DC, and with shaft lengths and propeller designs as required.

Tube Fitting

New tube fitting provides triple seal and axial support.

A new "clinch-type" fitting for use with any type of metal or plastic tubing has been developed by the Crawford Fitting Co., Cleveland 17, O. Marketed under the trade name of "Swagelok", these new fittings provide leakproof seals at three points. Two ferrules and a threaded chuck clamp around a tube with virtually no effect on the inner walls, thus leaving the flow of liquids or gases completely unimpeded. Tests have indicated that tubing will burst before these fittings will leak. The axial support which "Swagelok" fittings lend to a tube as-



sembly tends to drive vibration away from the fitting, minimizing fatigue.

Assembly operations are also aided by the design of the fittings, which require no disassembly before use. No flaring or other time-consuming preparations of the tubing to be used is required. The "Swagelok" is simply slipped onto the end of a tube and given one-and-one-quarter turns with any standard wrench. The resulting assembly is then ready for service. No damaging torque or twisting is transmitted to the tube during this brief tightening operation.

These new fittings are available in Monel, brass, aluminum, steel and stainless steel, Types 303 and 316. Connectors, unions, elbows and "tees" are all being produced, in a range of sizes that permit their use with tubing ⅛ to 1 inch in outside diameter.

Pressure Gage

New mechanical pressure gage measures pressures from 0-20 mm. mercury.

The Bristol Co., Waterbury 91, Conn., has developed a mechanical-type recording absolute pressure gauge. It involves a pressure-sealed lever arm so constructed that it is frictionless, free from lost motion, and free of turning moments due to changes in differential pressure across it. This design makes possible the recording of extremely low absolute pressure ranges.

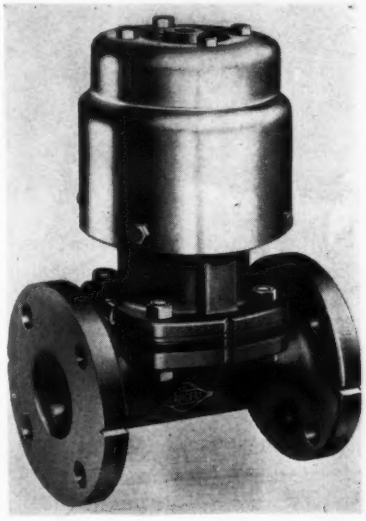
Known as the Series 500, the new instrument is offered in ranges from 0 to 20 mm. mercury up. The instrument is rugged in construction and can be used under ordinary plant conditions. It gives an accurate record of vacuum in terms of absolute pressure, inherently correct for barometric variations. The new instrument is offered as a recorder, as an automatic controller, and for remote measurement and automatic control of absolute pressure.

Diaphragm Valve Actuator

A lightweight and leak-proof actuator for pneumatic or hydraulic operation is available for Grinnell-Saunders diaphragm valves.

Freedom from product contamination, drop-tight shut off, chemically inert linings and diaphragms, isolation of working parts, low pressure drop and minimum simplified maintenance are now available in the new actuator which is an application of the Bendix-Westinghouse Rotochamber principle by Grinnell Co., Inc., Providence 1, R. I. Use of a rolling sleeve seal permits the elimination of sliding seals or stuffing boxes, does away with sealing and lubrication troubles and practically eliminates friction.

The valve diaphragm is protected from excessive closing pressures by an adjustable positive stop. Long-life and trouble-



free operation of the rolling-sleeve seal (tested up to 7,000,000 strokes) are characteristic of the new actuator.

While pneumatic or hydraulic pressures up to 105 psi may be used, usually only 50 pounds of actuating pressure is required to close the valve against 100 pounds pressure in the line being controlled. Pressure requirements will vary with the type of diaphragm required for the gas, liquid or solution being handled. No filters or regulators are required.

The new actuators are available in any of three combinations: air-to-close; air-to-open; and double acting. There are sizes from ¾″ to 6″.

• Featuring one piece, forged bodies, a line of improved *high pressure needle valves* is in production at the C. A. Nor-

gren Co., 222 Santa Fe Drive, Denver 9, Colo. These valves have tapered point needles for closer flow control and the valve stem is hard chrome plated for maximum service. They are designed for control of air, fluids and gases under pressures up to 3000 psi. Three types are offered: globe, angle, and tee, in ⅛" and ¼" pipe sizes. Each type is manufactured in three materials: brass, steel, and stainless steel. Steel bodies are cadmium plated and the brass and stainless steel bodies are finished natural.

• The Standard Stoker Co., Inc., has a new type of *positive displacement blower* in production at its Erie, Pa. plant. The blower is available in capacities from 100 to 15,000 cfm and for pressures up to 20 psi. A 2000 cfm Standardaire blower weighs approximately 1000 pounds. Because it may be operated at high speeds the blower lends itself to direct drive by standard motors.

• A *turbine type pump* with impeller fastened to an enlarged shaft by a lock nut and a woodruff key eliminating metal to metal contact has been introduced on the market by the Roy E. Roth Co., Rock Island, Ill. This new development features sealed in grease ball bearings which eliminates the dangers of bearing rust or improper lubrication. The new design eliminates "freezing" and stalling due to temperature changes when handling hot liquids. Other features of the new turbine type pump include the development of high pressures in single stage construction and heads and impellers that are renewable when the capacity of the pump is to be changed.

• The U. S. Stoneware Co., Akron, O., has added a new Tygon paint coating to its line of Tygon protective coatings. Designated as Series "K," it is a self-priming vinyl base paint that adheres tightly to metal, wood, or concrete. The new paint was developed primarily to fill the need for an easily-applied protective coating to resist crossive conditions not sufficiently severe to require use of the multiple coat series of Tygon paints. For normal conditions two or three coats provide effective protection. Series "K" Tygon paints may be brushed or sprayed; they air-dry quickly or may be baked. Tygon Series "K" shows excellent resistance to corrosive fumes of almost all acids and alkalies; as well as to excessive humidity, grease, oil, and alcohols. It is softened by aromatic hydrocarbons, ketones and esters. Series "K" is non-oxidizing, non-inflammable when dry, and possesses an upper temperature limit of approximately 200° F. It is available in black, white, clear, gray, red, green and aluminum.

• Pacific Valves, Inc., 3201 Walnut St., Long Beach 7, Calif. has added a new valve to their present line of cast steel valves, the 150 psi. Type 316 stainless steel, O.S. & Y., bolted bonnet, *gate valve* with flanged or screwed ends. This valve is available in sizes ranging from ½" to 6" with flanged ends machined to M.S.S. or A.S.A. specifications, and in sizes ½" to 2" with screwed ends. Bodies and bonnets will be regularly furnished cast of 18-8 S Mo stainless steel or cast of Alloy 20 (Durimet 20) stainless steel.

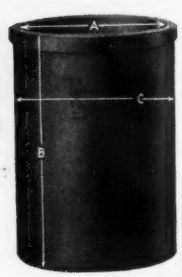
• The B. F. Gump Co., 431 S. Clinton St., Chicago 7, Ill., has announces added the Series 380, Draver "Micro-Master" *feeder* to their present line. In the new feeder the usual double-acting ratchet drive mechanism has been replaced with a continuous rotary motion, infinitely variable speed drive that has a controlled speed range from zero to maximum rpm. Capacity is controlled by simple micrometer-type adjustment. Adjustments may be made while unit is in operation. With this type of continuous rotary drive the feeding cylinder, composed of staggered wing pockets, rotates at the desired speed and produces a steady, uninterrupted flow of material.

• A new line of *air-operated control instruments*, the Series 500 Controllers, has been announced by The Bristol Co., Waterbury, Conn. Included are controllers for automatically controlling temperature, pressure, flow, liquid level, humidity, and pH value. The new controllers have calibrated control actions. Reset rate, derivative time, and proportional band adjustments are accurately calibrated and re-

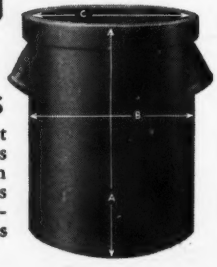
For Acid Storage and Mixing
"U. S." CHEMICAL STONEWARE

JARS, POTS, TANKS

"U.S." Chemical Stoneware Pots, Crocks and Tanks are ruggedly built with extra heavy walls and bottoms to stand up under tough usage. The close-grained, non-porous body (made from specially selected and processed clays) does not absorb odors. The smooth, salt-glazed surface and well-rounded corners make cleaning easy.



CYLINDRICAL POTS
(without handles, but with or without covers or outlets, as desired) are made in 15 standard sizes with capacities ranging from 15 gallons to 500 gallons.

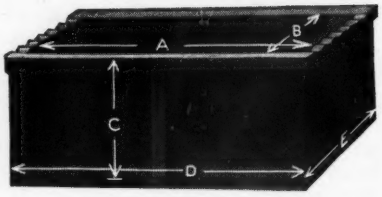


CYLINDRICAL POTS WITH HANDLES
(with or without covers or outlets, as desired) are made in seven standard sizes with capacities ranging from 2½ gallons to 30 gallons.

ACID AND CORROSION-RESISTANT ALL THE WAY THROUGH

All "U.S." Chemical Stoneware Pots, Crocks, and Tanks are available in either "standard" or "Ceratherm-500" heat-shock resistant bodies.

Write for your free copy of Bulletin 405 showing our complete line of chemical stoneware storage and mixing equipment.



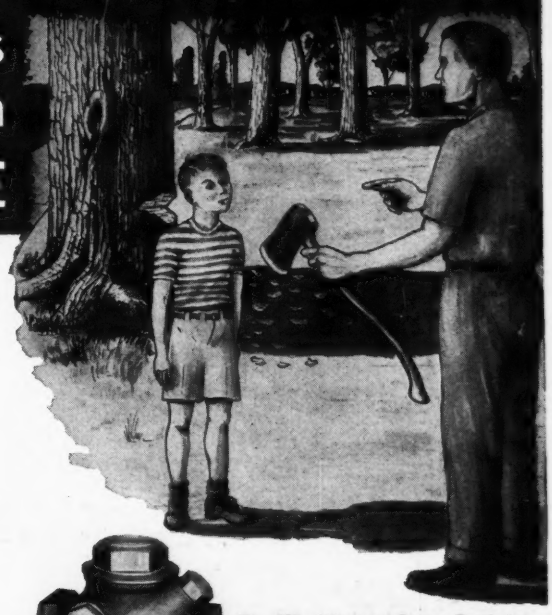
RECTANGULAR TANKS
are manufactured in 14 standard sizes with capacities ranging from four gallons to 320 gallons with or without outlets.

422 A

U. S. STONEWARE
Akron 9, Ohio

"Don't send a boy to do a man's work"

There's a Powell Valve* that's just *right* for every known FLOW CONTROL SERVICE



Most valve failures are the result of misapplication . . . installing valves that aren't of the right design or sturdy enough to do the job for which they are selected. In other words, it's like "sending a boy to do a man's work."

On the other hand, it's a waste of money to specify costly valves for services where less expensive ones may be used. This amounts to putting a man on a job that a boy can do.

To avoid misapplication: (1) standardize on Powell Valves; (2) consult Powell Engineers as to which valves are specifically adapted to each and everyone of your individual flow control requirements.

Powell makes such a *complete* Line* that there is a Powell Valve *exactly* suited to every existing service, from the simplest to the most specialized or exacting. Ask your nearest Distributor—or write direct.

Fig. 560—200-pound Bronze Regrinding Horizontal Swing Check Valve with screwed ends, screwed-on cap and regrindable, renewable bronze disc.

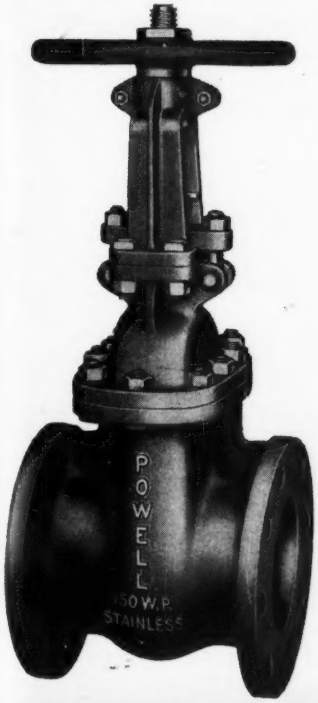
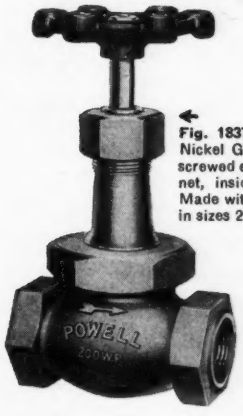


Fig. 2453-G—Large 150-pound Stainless Steel Gate Valve. Bolted flanged yoke-bonnet, outside screw rising stem and tapered solid wedge. Made in sizes 5" to 30", inclusive.

Fig. 500 — 125-pound Bronze Gate Valve with screwed ends, screwed-in bonnet, inside screw rising stem and tapered wedge: solid in sizes ¼" to ¾"; double in sizes 1" to 3".



← Fig. 1837 — 200-pound Nickel Globe Valve with screwed ends, union bonnet, inside screw stem. Made with bolted bonnet in sizes 2½" and 3".

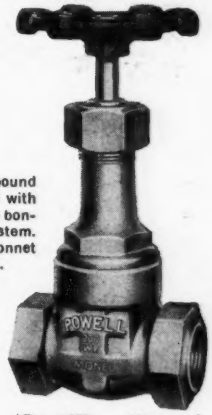


Fig. 1828 — 200-pound Monel Metal Gate Valve with screwed-in bonnet, screwed ends and inside screw rising stem.

*** Powell Valves are made in Bronze, Iron, Steel and a wide selection of Corrosion-Resistant metals and alloys. Valves of every type—Globe, Angle, Gate, Check, Non-return and Flush Bottom Tank Valves—are included in the Complete Powell Line.**

The Wm. Powell Company, Cincinnati 22, Ohio

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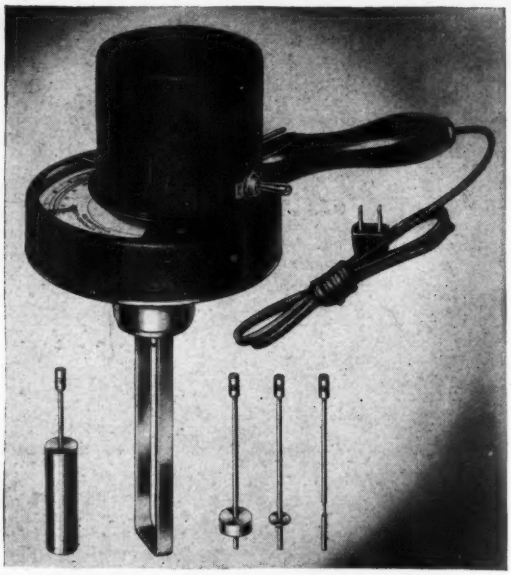

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Accurate, Portable, Easy to Operate!

BROOKFIELD VISCOSIMETER

THE PORTABLE INSTRUMENT YOU NEED to test viscosity in laboratory or plant. Plugs into any outlet. No technical skill or knowledge required to operate. Highly sensitive. Gives fast, accurate readings in absolute viscosity. Compact . . . self-contained . . . only 3½ lbs. in weight! Featured by Will in three models to meet your specific requirements.

26580—(ILLUSTRATED), LVF. Low viscosity range, with 4 speeds, 4 spindles, 16 ranges, 0 to 100,000 cps ... **$246**

26585—RVF. Medium viscosity range, with 4 speeds, 7 spindles, 28 ranges, 0 to 2,000,000 cps..... **$246**

26590—HBF. High viscosity range, with 4 speeds, 7 spindles, 28 ranges, 0 to 32,000,000 cps..... **$240**

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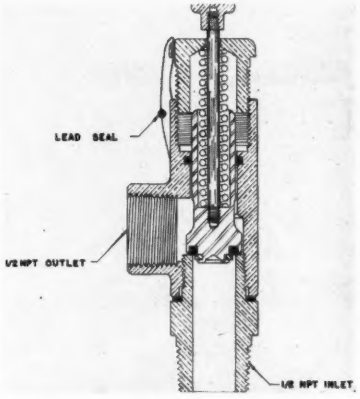
producible. They have only one service adjustment. Controllers can be completely disassembled and after being reassembled, with replacement parts, only one adjustment is required to put the system in exact calibration. All Series 500 Reset Controllers are equipped with reset action stops. The new instruments are offered in five types of control action: on-off, proportional, reset, derivatives, and reset plus derivative. The instruments are readily convertible from one type to another.

• American-LaFrance-Foamite Corp., Elmira, N. Y., is introducing a complete new line of 2½-gallon silicon bronze *fire extinguishers* with Monotype Construction shells. They are foam, soda-acid, and anti-freeze water types, approved by Underwriters' and Factory Mutual Laboratories.

With an ultimate shell strength of 1400 pounds per square inch, these new units are 65% stronger than any previous Alfco drawn-shell models, twice as strong as welded silicon bronze units, 2½ times as strong as fabricated copper extinguishers.

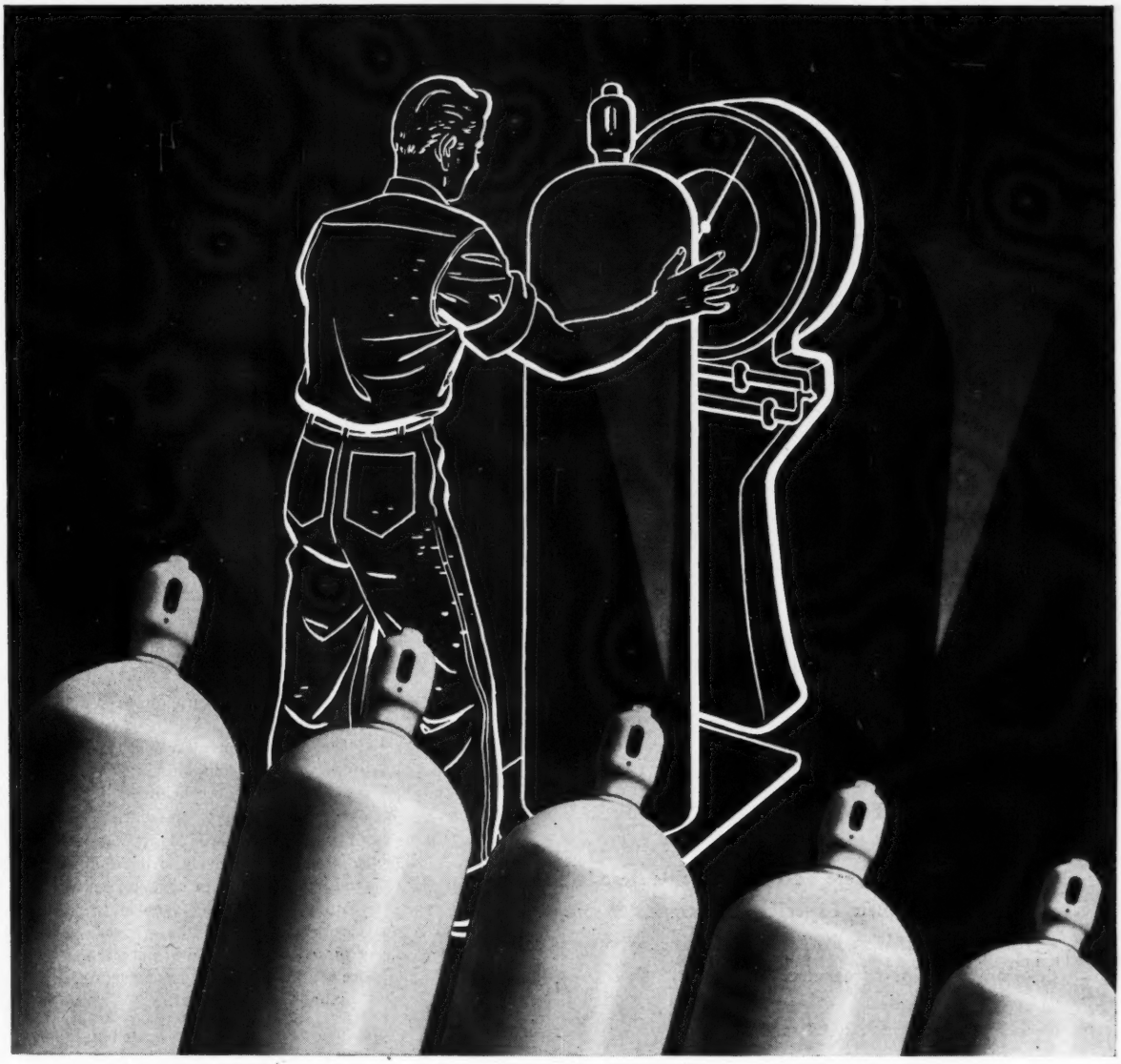
• To lick the problem of costly Freon leakage, engineers at Black, Sivalls and Bryson, Inc., 720 Delaware, Kansas City 6, Mo., have designed a *Freon relief valve*

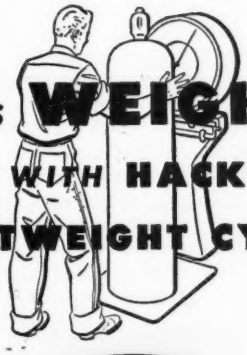


that consistently seats tightly even after repeated "popping." This new valve, the CGA½-2, has been tested and accepted by the ASME. A single valve, popped by Freon pressure as many as 200 times, was still Freon-tight after each closing.

The possibility that bits of dirt or scale may lodge beneath the valve plug and keep it from closing tightly makes it wise, where large amounts of Freon are involved, to use a saftey head rupture disc with the valve. If the valve should leak, the rupture disc will temporarily hold the gas in the system.

• Pressures up to 6000 psi with a displacement of one to three ft.^{3}/min., are produced by a new *semi-portable compressor* now in production by Norwalk Company, Inc., S. Norwalk, Conn. The unit is constructed entirely of steel or if





COSTS WEIGH LIGHTER WITH HACKNEY LIGHTWEIGHT CYLINDERS

Yes, costs do weigh lighter on the minds of shippers using Hackney Cylinders. That's because Hackney Cylinders are comparatively light in weight to assure shipping and handling economies.

They give utmost protection, too—thanks to their rugged strength. It's the Hackney Deep Drawing Process that makes possible both these desirable qualities—strength and light weight—as it assures uniform sidewall thickness and eliminates all excess material. Then, to improve the physical properties still further, controlled heat-treating is employed after complete fabrication.

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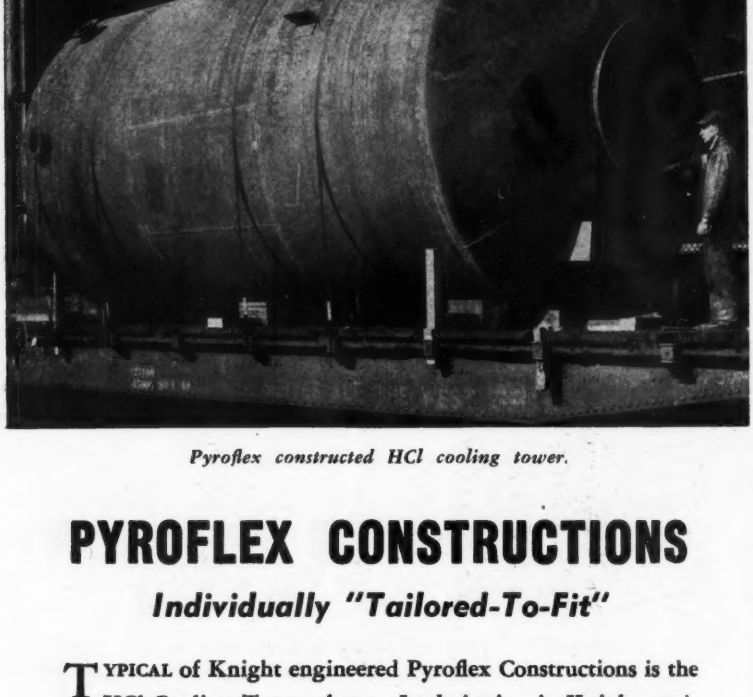
CONTAINERS FOR GASES, LIQUIDS, AND SOLIDS



Pyroflex constructed HCl cooling tower.

PYROFLEX CONSTRUCTIONS

Individually "Tailored-To-Fit"

TYPICAL of Knight engineered Pyroflex Constructions is the HCl Cooling Tower above. In designing it, Knight engineers carefully checked over eventual service conditions under which it would operate. As a result this complete functional unit is tailored to fit a specific job—corrosion proof not only against HCl but also all other corrosive conditions that may develop at point of service.

Each Pyroflex Constructed tank, tower, fume washer, absorber, etc., is individually designed to meet the requirements of the situation in which it will be used. In each case Knight engineers incorporate the materials best suited to the individual service conditions. Materials may include ceramics, glass, fused silica, plastics, carbon or any other suitable material. Consequently, Pyroflex Constructed Units offer longer, trouble-free service with less down time and lower maintenance costs.

When inquiring about Pyroflex Constructions, please specify type of equipment in which you are interested as well as service conditions involved.

At the Exposition of Chemical Industries in New York, see our Exhibit No. 53.

Maurice A. Knight 210 Kelly Ave., Akron 6, Ohio

Acid and Alkali-proof Chemical Equipment

desired, non-corrosive materials. Smaller sizes can be built.

This four stage compressor is complete in every respect, and can handle any gas that can be pumped. All parts are accessible. The compressor was designed for use in laboratories and pilot plants, wherever relatively small volumes are required at pressures up to 6000 psi. It can be supplied on wheels or on solid base.

LABORATORY EQUIPMENT

Infra-red Analyzer

New gas and liquid analyzer is used for measuring atmospheric contaminations and process control.

According to the Mine Safety Appliances Co., Pittsburgh 8, Pa., the M.S.A. "Lira", Luft-Type infra-red analyzer, can detect minute as well as heavy concentrations of various atmospheric or liquid contaminants. Also, it may be made sufficiently selective that it can measure one product in the presence of several. This feature makes it useful for process control.

The "Lira" operates upon the established principle that most gases, vapors, and liquids will absorb infra-red light in a portion of the spectrum which is specific for each product. This phenomena can be used to selectively detect a specific product in a simple or complex mixture.

An example of its uses in industrial process control would be in measurement of propane and butane in natural gas before and after that gas has passed through a natural gasoline plant.

• The new induction heated *mercury still* of Eberbach & Son Co., Ann Arbor, Mich., is a fast, economical producer of high purity distilled mercury. Electronic controls are automatic; the still has start and stop buttons, and the operator needs only to supply raw mercury which begins to flow within 4 to 6 minutes after the start button is pushed. Power consumption of 500 watts produces 5 to 7 pounds of distilled mercury per hour. Fully automatic safety devices protect the unit which operates directly from 115 volt, 50-60 cycle A.C. It occupies floor space 18" by 24", and stands approximately 6' high.

• To complement its complete line of *radiation detectors,* Nuclear Instrument and Chem. Corp., 223 W. Erie St., Chicago 10, Ill., is marketing a new, thin mica, end window counter. This counter, Model D31, has a plateau length of 200 to 300 volts, with a slope of only 3% per hundred volts. Threshold voltage is between 1050 and 1300 volts, and counting life is at least 10^8 counts. Each counter is fitted with a standard four prong socket

which will fit into Nuclear's mounts and shields, as well as those of other manufacture. Model D31 Counter is available with window thickness from 2 to 3.9 milligrams per square centimeter. Model D32 Counter, of identical construction, is available with window thickness between 1.5 and 2.0 milligrams per square centimeter.

• A new "synthetic sapphire" *mortar and pestle* of Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa., is said to be superior to ceramic and steel mortars for this purpose. It will permit grinding of beryl, Carborundum and similarly hard substances with hardness ratings below that of tungsten carbide.

• The Nucleonic Corp. of America, 499 Union St., Brooklyn 31, N. Y., has developed a *radiation counter* which combines the functions of a scaling unit, a radiation survey meter, a count rate meter and a contamination detector. It measures only 12½" x 9⅞" x 8½" and weighs less than 24 pounds. Some of the features are: continuous 24 hour per day stable operation without overheating; binary or decade scaler, choice of scaling values; self contained high voltage supply from 500-1600 volts, (higher voltage optional); resettable register mounted on panel; provision for elapsed and pre-determined timers and pre-set count; count rate meter with ranges of 500, 5000 and 50,000 counts per minute; a special circuit keeping meter fluctuation minimum over the three ranges and permitting continuous variation of meter response.

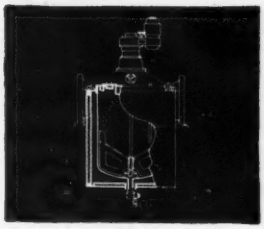
• Precision Scientific Co., 3737 W. Cortland St., Chicago 47, Ill., has completely redesigned the Interchemical *rotational viscometer* and placed all operating parts within one housing. The housing table top contains controls and dials within easy reach of the operator.

The Interchemical viscometer produces consistency curves instead of single point measurements which are usually misleading for plastic, thixotropic materials. It consists essentially of a rotating sample cup and a stationary bob immersed in it. When the cup is rotated, the viscous drag on the bob is imposed on a coiled spring which is twisted through an angle measured on a calibrated disk. The speed of cup rotation can be varied from 10 to 400 rpm in steps of 10 rpm.

The consistency curve is produced by changing the speeds over a series of steps from low to high and back again and noting the corresponding deflections of the graduated disk. Breakdown of thixotropic materials can be obtained from the hysteresis loop formed by plots of the up- and down-curves. From the down curves, Newtonian and plastic viscosities in the range of 1 to 2500 poises and yield values up to 180,000 dynes/cm.^{2} may be determined.

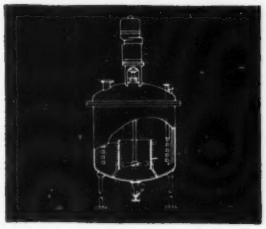
*5 More Patterson-Kelley Solutions to your Kettle Problems

— Series No. 2

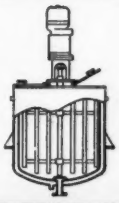


F Electrically Heated Process Kettle
Designed for the higher temperature ranges while offering a wide variation in speed. Low speed to provide sufficient torque when melting solids with a selection of higher speeds for efficient agitation after material has attained lower viscosities. Unit furnished complete with automatic controls and insulated jacket.

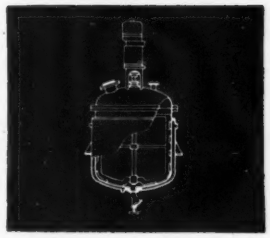
G Cone Bottom Mixer
The Patterson Cone Type Mixer is suitable for use as a wash tank or for mixing operations requiring provision for the settling of solids or the removal of sludge.



H Reactor with Coil, Draft Tube and Propeller
The arrangement of propeller and draft tubes provides a relatively high velocity of mixture across the coil surface, assuring maximum heat transfer rate for either heating or cooling. Coil permits economically the use of high pressure steam.



I Fully Jacketed Mixer with Gate Agitator
Primarily used for the mixing of pastes. The paddles may be vertical or horizontal—with or without stationary blades, depending on the specific duty.



J Jacketed Kettle with Scraping Agitator
When processing heavier liquids or pastes which might cake or burn due to local overheating and when adequate heat transfer has to be maintained under those conditions, a positive scraping type agitator is indicated.

Continuing a series of advertisements on Patterson Kettles. If you would like to know what was run previously let us know. Write to us anyway, if you have any requirements in the way of special or standard kettles.

**Second of a series of kettles and their application.*

the P-K please send your process equipment catalog

Patterson-Kelley Co., Inc.

13 Lackawanna Avenue • East Stroudsburg, Pa.

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IT'S NEW
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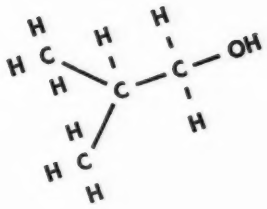

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PACKAGING & SHIPPING

by T. PAT CALLAHAN

Packaging and Transportation Symposium

A SYMPOSIUM on packaging and transportation of chemicals, sponsored by the Marketing Section of the American Chemical Society's Division of Industrial and Engineering Chemistry, was held in Atlantic City on September 20, 1949, in conjunction with the 116th ACS meeting. This was the first such symposium conducted and the papers presented by leading packaging experts represented a very successful endeavor. Ten papers were presented in a morning and afternoon session.

M. F. Crass, Jr., secretary of the Manufacturing Chemists' Association, presided and opened the meeting. Mr. Crass pointed out that safe transportation has not come about without diligent effort, research, and cooperation on the part of chemical manufacturers, container manufacturers, carriers, and regulatory agencies.

He also stated that because of the diversity of the industry's products and the hazardous nature of many of them, long periods of study are generally required before a container or a safety device can be developed which will meet all safety requirements, be acceptable to the regulatory agencies, and be practicable in so far as economics and consumer acceptance are concerned.

The influx of state and local legislation which threatens to impose drastic restrictions over the packaging, storage, labeling, transportation, and use of dangerous chemicals could, if unchallenged, seriously impair the present structure of our industry. Mr. Crass concluded that the chemical industry favors reasonable legislation designed to safeguard the public, provided that such legislation is uniform between the states and does not conflict with federal requirements.

H. A. Campbell, chief inspector for the Bureau of Explosives, discussed regulations governing the packaging and transportation of dangerous articles. He declared that the necessity for regulations governing the transportation of hazardous articles first came to the attention of Congress after several serious explosions occurred during the manufacture and transportation of dynamite. As a result, an act to govern the transportation of explosives and other dangerous articles was promulgated on May 30, 1908, and is the genesis of the federal regulations in effect today.

Mr. Campbell explained the current act, which requires the Interstate Commerce Commission to formulate regulations for the safe transportation of explosives and other dangerous articles, including flammable liquids, flammable solids and oxidizing materials, acids and other corrosive liquids, compressed gases, and poisonous articles in accordance with the best known practicable means for securing safety in transit and to cover the packing, marking, loading, and handling while in transit and the precautions necessary to determine whether the material when offered is in proper condition to transport.

Mr. Campbell told those present that the ICC on at least four occasions each year amends its regulations to provide for the shipment of new hazardous materials that are developed for commercial use and that may be offered for transportation. He also pointed out that the Bureau of Explosives occupies a unique position in the picture of safe handling and transportation of hazardous articles. It is an agency designated by Act of Congress to assist in providing ways and means for safety in transportation and preparing for transportation of hazardous materials. Membership in the bureau includes shippers, manufacturers, and carriers.

Steel Containers

L. F. McKay, representing the Steel Shipping Container Institute, Inc., presented a paper on corrosion-resistant linings for steel shipping containers. This paper presented the results of a comprehensive research program directed toward the improvement of lined shipping containers. This investigation, being conducted for the Steel Shipping Container Institute by the Battelle Memorial Institute, is divided into three major phases: (1) effects of metal surface conditions on coatings performance, (2) metal surface preparations for organic coatings, and (3) relative resistances of various coating systems to mechanical abuse and attack by specific products.

J. T. Fuess, Eastman Kodak Co. and chairman of the MCA Committee on Labels and Precautionary Information, presented a paper on the precautionary labeling of hazardous chemicals.

In 1945, the MCA embarked on a program of precautionary labeling of hazardous chemicals. The purpose of the program is to provide a uniform and adequate method of indicating the hazards inherent in an individual chemical or mixture of chemicals. It is important that the essential information be in a form to reach the ultimate user of the product and in terms which will be readily understood. A label which always stays with the container and which contains in easily legible form a statement of the hazards and brief instructions on what not to do or what to do is considered to be the most effective way of accomplishing the desired object of protecting the user. In the execution of this program certain principles were developed. These principles were discussed in some detail.

The writer, who is with Monsanto Chemical Co. and chairman of the MCA Miscellaneous Packages Committee, presented a paper on chemical container development from the marketing and consumer standpoint. He pointed out that three fundamentals control the suitability of containers used in the chemical industry: safety, appearance, and economy. Safety at all times must play the most important part in the development of any container from both the producer and the consumer standpoint.

Complaints on packaging should be treated in the same category as complaints on product and followed through just as assiduously. Bulk handling of chemicals in large units such as tank cars, hopper cars, container cars, and larger units than the conventional package should be explored.

Freight on containers (which carry the same rate as the product) must be considered. Lightness of the container, consistent with safety, thus becomes an important consideration.

Marking and labeling of containers is very necessary from the consumer's standpoint, and close attention to this phase of packaging leads to good customer relations.

The writer also pointed out that sales departments can be of inestimable value in their contacts with their customers in obtaining information pertaining to all phases of packaging as shipments arrive at the consumer's plant. Although the

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The new Barrett Safety Ramp speeds loading and unloading time. It is readily placed and a few turns of the crank will provide a 12-inch variation in height at one end of the ramp.

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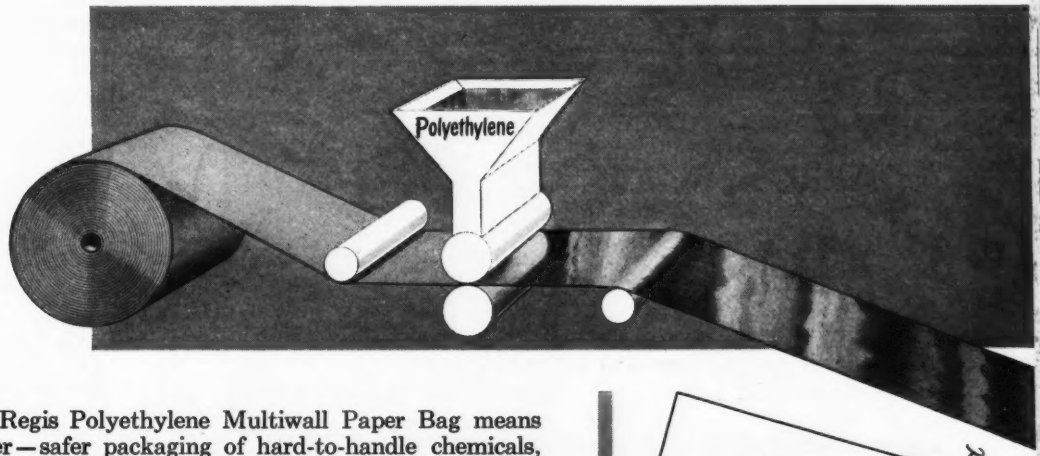

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By solidifying a film of polyethylene directly on the kraft paper, St. Regis produces a strong, yet lightweight, protective sheet that resists air-borne moisture and chemical reaction as no other sheet does—has good flexibility even at extremely low temperatures, and is compatible with other plies in the Multiwall.

Advantages

- More moisture proof
- More acid resistant
- More alkali resistant
- More grease proof
- Does not bleed at normal packing temperatures
- Does not crack, even at low temperatures
- Greater strength, non-toxic, tasteless, odorless

ST. REGIS POLYETHYLENE MULTIWALLS are now in use for packaging such items as:

Asphalt Sealing Compounds	Detergents
Beta Naphthol	Meat Trimmings
Brown Sugar	Mono Sodium Phosphate
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producer has the opportunity to select the container of his choice, he must always keep in mind the reaction of the consumer to whom the product is shipped.

Fiber and Paper

H. A. Bergstrom, technical director of the Container Co., Division of Continental Can Co., presented a paper on the development and use of fiber drums in the transportation of chemicals. Mr. Bergstrom discussed the origination of the fiber drum industry and pointed out that early drums were crudely made from poor materials. During the '20s, two developments made possible the modern fiber drum: the working out of machinery to convolutely wind drum sidewalls and the introduction of southern kraft linerboard. In the '30s, improvements followed rapidly. These included better basic designs plus methods of fabricating protective barriers and linings into the drum.

Mr. Bergstrom discussed some of the major fiber drum developments which have been accomplished since the war. These are:

A very water-vapor-resistant barrier of aluminum foil laminated between two sheets of kraft using a hot-melt resin laminant. This is fabricated into the side wall and heading to form an integral part of the drum.

The combination of a fiber drum plus a plastic (such as polyethylene or saran) inner bag.

Specially constructed drums for shipping corrosive and hazardous chemicals such as sodium hydrosulfite and monochloroacetic acid.

New chemically resistant inner linings and coatings.

More durable and water-resistant exterior protective and decorative coatings.

In the afternoon session R. B. LeRoy, Bemis Brothers' Bag Co., discussed multiwall paper shipping sacks in the packaging of chemical products.

Mr. LeRoy declared the chemical industry is interested in multiwall paper shipping sacks both as bag users and as producers of chemicals used in the paper from which bags are made.

While a wide range of variable factors in the bag manufacturer's plant, the bag user's plant, and en route to the ultimate consumer influence bag design and performance, the versatility inherent in these multiple-ply carriers allows a very large proportion of all requirements to be met. This derives from the versatility possible through the treating of each ply to perform a different function and hence utilizes the advantages of combination. Since the bag is the only mechanically flexible container, it is subject to all the distortions which flexibility admits. It therefore requires of specialty papers incorporated in their wall structure not

MOISTURE CONTROL

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Use Fulton Waterproof Paper Lined Bags to preserve the *Natural* condition of your product

Fulton WPPL Bags are made from *quality* burlap or cotton material laminated with a waterproof adhesive to a special crinkled kraft paper lining. The result is a sift proof and moisture proof package that is much stronger than an unlined textile bag.

In addition to protecting your product from moisture, Fulton WPPL Bags offer you other important advantages over rigid containers. These include lower cost, ease of handling, less storage space, lower freight costs, and elimination of the burdensome record-keeping of returnable containers.

Fulton WPPL Bags are available in a variety of linings and adhesives for specific commodities. Write our nearest plant for samples and prices.

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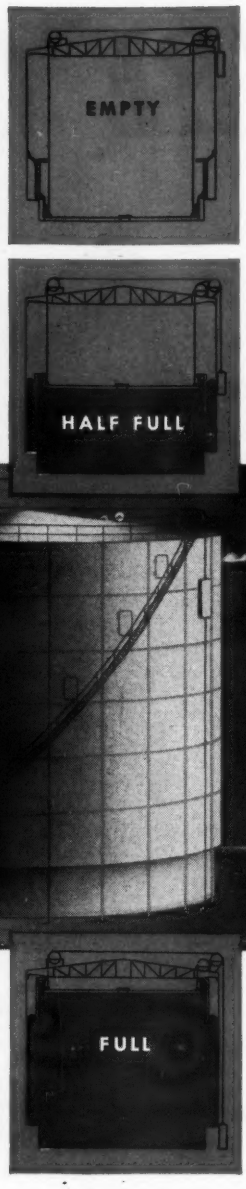

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only the characteristics which led to their inclusion initially, but their ability to retain these characteristics when subjected to distortion. The "form factor" is hence of great importance, inasmuch as it sometimes influences and sometimes is influenced by the bag user's production line. The package form is also of paramount importance in performance.

Through control of the variables it is possible to package even the costliest chemicals in multiwall paper shipping sacks.

R. F. Uncles and R. W. Lahey, American Cyanamid Co., advocated coordinating package development with new product research. Packaging development that is properly coordinated with new product research provides assurance that the product will reach the customer safely and uncontaminated. Packaging should be studied concurrently with process development if costly errors due to hurried selection of containers are to be avoided.

To conduct such an investigation with maximum efficiency requires a well organized packaging engineering group, operating as a staff function, which provides means for centralization of all pertinent information, evaluation of test data, and decisive action based on that evaluation. This group, together with the container testing laboratory functioning as a part of the research team, should be guided by one with an extensive knowledge of types and limitations of containers, packaging machinery, materials handling, and government and other regulations affecting material shipments.

The packaging organization, involving as it does many different groups, must be flexible enough to take advantage of the knowledge and experience of all departments. The success of its work depends largely on its ability to keep abreast of all phases of product development and market potentialities.

The obligation of the packaging group should extend beyond the routine testing and selection of containers. Fundamental research should be encouraged, and present-day empiricism replaced by scientific studies.

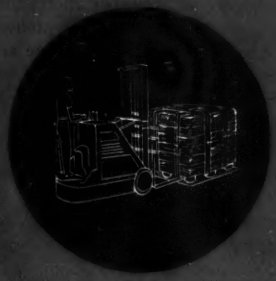
Car Shipments

H. J. Gronemeyer, Du Pont Co. and formany years chairman of the MCA Committee on Tank Cars, discussed transportation of chemicals by tank cars. Transpanded, not only in number of chemicals, portation of chemicals by tank car has exbut in tank car carrying capacity as well. He also pointed out that dry chemical commodities which permit free flowing discharge are being more extensively shipped in covered hopper cars.

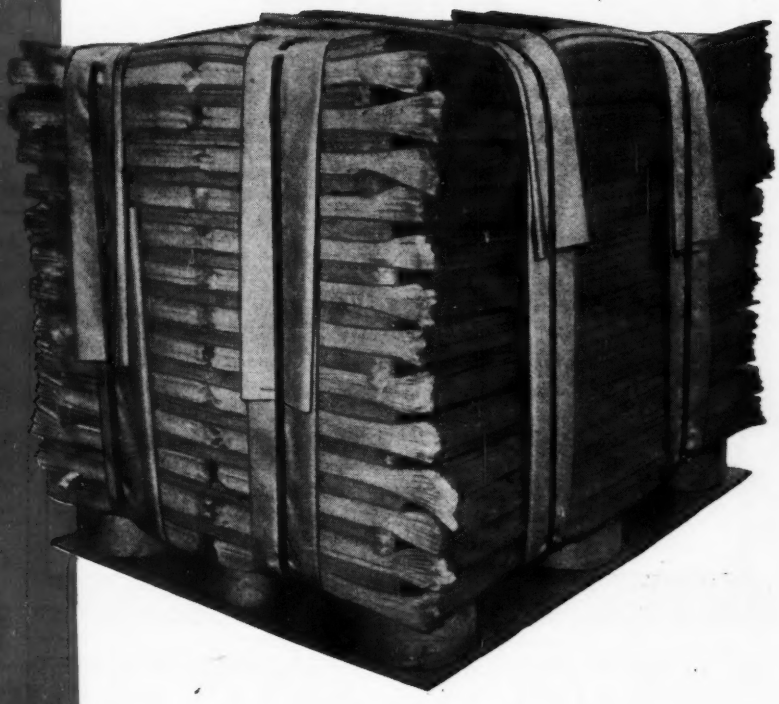
Increased railroad speeds and longer trains require that the equipment used

from design to delivery-

BETTER MULTIWALL BAGS



LOWER HANDLING COSTS



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Palletized shipments of Bagpak bags lower handling costs for you—a typical example of how Bagpak engineers work as your "partners in packaging".

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PHOSPHORUS PENTACHLORIDE	POTASSIUM CHLORATE
PHOSPHORUS PENTASULFIDE	POTASSIUM PERCHLORATE
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on railroads must be sturdy and particularly suitable for the chemical to be transported. Also of importance are construction details complying with ICC regulations and Association of American Railroads standards.

Many different types of tank cars are used for the large tonnage of chemicals transported over railroads. This means different types of car construction as to underframe and trucks as well as different tank materials, tank insulations, heating systems, etc.

The concluding paper of the symposium was presented by P. P. Kennedy, Du Pont Co. and chairman of the MCA Glass and Wood Packages Committee. The subject of this paper was problems in packaging and transportation of hydrofluoric acid, aqueous and anhydrous. Mr. Kennedy discussed the large amount of work conducted by the Technical Committees of the MCA in developing proper containers, including tank cars, for the shipment of hydrofluoric acid. This program extended over a considerable period of time and many MCA recommendations in connection with the packaging of hydrofluoric acid have now been accepted by the ICC.

Calcium Chloride Bag

The Dow Chemical Co. is now shipping Dowflake calcium chloride in a new and greatly improved bag. This widely used product demands a heavy-duty, moisture-proof package. The bag is Dow-produced, made exclusively for packaging Dow chemicals.

The new Dowflake bag is made from 55-pound kraft paper. This paper is treated with a coating of asphalt adhesive to which a mesh of strong cord is added. The treated paper is then joined with another sheet of 55-pound kraft paper and run through roll presses. This laminated sheet is then machined into a tube and the ends are sealed by stitching and taping.

Packaging Course

New York University's Adult School is offering a fifteen-week course for the packaging profession, "Packing for Safe Shipment."

Covering a broad range of topics essential to adequate performance in industry, the course is being presented by men from industry who wish to educate large users of packing material in the proper and economic ways of safe shipment. The principal packing and shipping materials such as corrugated and solid fiber-board, wooden containers, bags and sacks, adhesives and closures will be discussed. Specialized techniques such as container design, carloading and bracing, export packaging and materials handling will also be treated.

There's "magic" in these six numbers

...PERHAPS "MAGICAL" PROFITS FOR YOU, TOO

WHAT DO THESE NUMBERS DO? They pinpoint the six advantages of packaging products in metal containers.

ONE: Cans fill and close easier... faster.

TWO: Cans are break-proof.

THREE: Cans protect contents from light, air, dirt, insects, moisture.

FOUR: Cans are lightweight... mean lower shipping costs.

FIVE: Cans stack easier... stay that way.

SIX: Cans mean eye-appeal for impulse buying.

What other type package gives you *all* the advantages of metal containers?

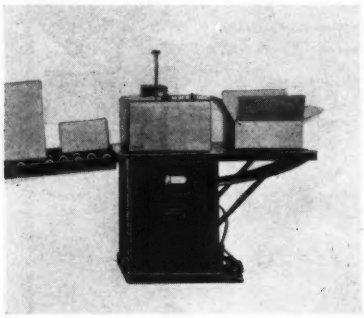
None!

AMERICAN CAN COMPANY
New York • Chicago • San Francisco

This trademark CANCO *is your assurance of quality containers. Look for it!*

Case Sealer

The A-B-C Packaging Machine Corp. has just released a new semi-automatic case sealer, the A-B-C Sealall. This



sealer will handle cases of different widths, heights and lengths, one right after the other. No adjustment is necessary. The A-B-C Sealall eliminates the necessity of storage conveyors or the down time required to change from one size case to another. Speed from 1 to 5 cases per minute. For further information write A-B-C Packaging Mach. Corp., 220 Hampshire St., Quincy, Ill.

Label Gummer

A new low-priced hand-operated label gummer, particularly adapted to any industry where relatively small labels are used, has been placed on the market by King Sales and Engineering Co., 210 First St., San Francisco, Calif. The new machine, Model F6-H, will apply adhesive to labels of any length or shape up to 5¾ inches in width. An unskilled worker can operate it without any special training. With dimensions of 10"x10"5½" and weight of ten pounds, the new King hand-operated gummer may be easily carried around by hand and handle the labelling needs of various departments.

By using ungummed labels the machine cuts material costs as well as inventory waste on gummed labels. Labor savings in both application and cleanup time can be effected by firms which have been using both glue and brush application. The King gluepot lifts off and is cleaned in seconds by merely rinsing in water.

Motorized Cutter for Steel Drums

The portable motorized steel drum head cutter of Schinker Mfg. Co., 6514 S. Western Ave., Chicago 36, Ill. removes the heads of all sizes of empty or loaded drums in two minutes and leaves a safe turned-up flange. There is no danger from spark or flame and operation is noiseless. Operation begins when it is plugged into an electrical outlet.

Anode Package

The Harshaw Chemical Co. has solved the problem of shipping anodes with a cheap and simple palletizing arrangement which can be thrown away after use.

In making up the package the anodes are placed in a holding jig. Corrugated board is placed above, below and between the anodes. Steel strap is then threaded through two holes in the skid

and up over the anodes. Drawing up the strap tight brings the skid up to the anodes. The anode package, save for the skids, is then wrapped with burlap, sealed, labeled and is ready for shipment. This design gives all the advantages of a pallet shipment with none of the disadvantages.

Although the finished package weighs 500 or 1,000 pounds, as the customer selects, yet it is easily handled with a fork lift or hand truck.

Packaging Machinery Manufacturers Meet

"The Long Range Outlook for the Packaging Machinery Industry" will be the subject of the opening session of the 17th annual meeting of the Packaging Machinery Manufacturers Institute, to be held at the Edgewater Beach Hotel, Chicago, October 31-November 2. Leading manufacturers will comprise the panel of speakers who will present, on Monday afternoon, their views and analyses of the long range outlook.

Opportunities for foreign business today and the future outlook for expanding foreign markets will be discussed by scheduled speakers at a symposium on Tuesday morning, including first-hand reports and evaluation of conditions abroad affecting markets for packaging machinery. The entire morning session will be given over to discussion of foreign business and related subjects.

An annual feature at Institute meetings—"Question and Answer Clinic," is scheduled for Tuesday afternoon.

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Chemical intermediate
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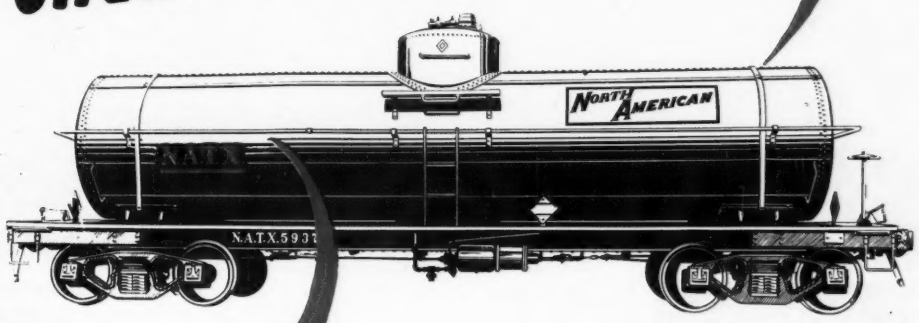
THIS SYMBOL MEANS SAFETY FOR CHEMICAL SHIPMENTS



This symbol also means service and dependability. It stands for all the helpful transportation knowledge that North American Car has acquired through more than forty years of supplying specially designed tank cars to leading chemical shippers. It is a guarantee of safe, economical railroad shipping.

Do you now have products shipped in drums that have reached tank car capacity? Discuss this with us.

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LABORATORY NOTEBOOK

Rare Chemicals

The National Registry of Rare Chemicals, 35 W. 33rd St., Chicago 18, Ill., is searching for the following materials:

3-Bromo-2-chloro-1-propene
2,6-Bis(bromomethyl)-p-cresol
β-Chloropropiophenone
Cyanogen
Cyclobutane
p-Fluorophenylhydrazine
2-Methyl-3-hydroxypropiophenone
3-Methyl-5-hydroxypropiophenone
2-Methyl-3-nitropropiophenone
3-Methyl-5-nitropropiophenone
Naphthalene-1,6-disulfonic acid
Bis-(2-(2′-fluoroethoxy)-ethoxy)methane
Pentamethylphenol
Durenol
2-Amino-1,3,4-triazol
N-Ethyl-N-tert.-butylaniline
Perfluoroethylcyclohexane
trans Hexahydrophthalic2acid
Perfluoroheptane
Colophene
1,1-Diacetylethylene
2,6-Bis(bromomethyl)-p-cresol
Dipropenyl ketone
2,2-Diquinolyl
Germanium difluoride
Gallium dichloride
2,4-Heptadiene-6-one
Tridecamethylene bromohydrin
Vinyl iodide
Vinyl propenyl ketone
Vinyl allyl ketone
Diallyl ketone
Naringenin
L-Galactose
L-Mannose
Benzene pentacarboxylic acid
p-Fluoroaniline
Hemipic acid

Relative Reactivity of Fluorine Compounds

The relative reactivities of various aromatic fluorine-containing compounds were given by E. T. McBee and F. E. Crane before the recent meeting of the American Chemical Society at Atlantic City, N. J. Using 15% aqueous KOH and a 19% solution of KOH in MeOH, data were obtained to support the following generalizations.

1. Electron-attracting groups favor loss of flourine from the aromatic ring, while electron-supplying groups inhibit it.

2. Monohalides are the only types of compounds in which chlorine on the ring is more easily removed by sodium alkoxides than fluorine. Highly substituted rings, such as hexafluorobenzene and hexachlorobenzene, lost fluorine more readily than chlorine.

3. Groups which accelerated the hydrolysis of substituted trifluoromethylbenzene by alkaline media were COO^-, SCF_3, SCH_3, OR, NH_2, and O^-K^+. Groups which decreased hydrolysis were Cl, F, CF_3, CH_2OH (in meta position), C_2F_5 and $-CF_2CClF_2$.

4. In the case of ring-halogenated trifluoromethylbenzenes, a high degree of substitution favored ready hydrolysis of both ring and sidechain halogen with fluorine removed faster than chlorine.

5. The order of reactivity to alkali of halogenated side chains was found to be: $CF_3 > CF_2CClF_2 > C_2F_5$. Deactivation effects of these groups on one another are in the order $CF_3 > C_2F_5 > CF_2CClF_2$.

Similar generalizations about aliphatic and alicyclic fluorine-containing compounds were reached.

1. Polychlorofluoroalkanes, which contained no hydrogen, proved to be very stable toward alkaline hydrolys.

2. The order of decreasing east of hydrolysis by alkali was determined as $CCl_3 > CCl_2F > CClF_2 > CF_3$.

3. Polychlorofluoroalkanes, which contained only one hydrogen atom were very reactive toward base.

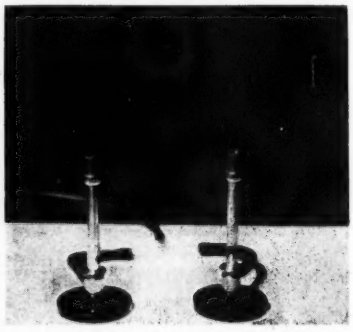
4. Alicyclic fluorocarbons exhibit high stability to base, but an increase in the length of side chains increased the reactivity of the fluorine atoms.

5. Allylic fluorine atoms were easily removed by alkaline hydrolysis.

6. One fluorine atom and a doubly bound carbon atom were very unreactive, having a stability comparable to that of a fluorine atom in a saturated fluorocarbon.

Laboratory Burners

The flame characteristics of natural gas and manufactured gas are so different that a change in supply necessitates the alteration of all gas burning appliances. Laboratory burners of the Bunsen type, however, can not perform satisfactorily with natural gas. The National Bureau of Standards investigated the operating characteristics of 16 burners to determine the reasons for unsatisfactory performance. They were found to be too small a port area, improper throat size, and insufficient primary air opening. Two burners were then modified so that they complied with theoretical requirements for good



burner operation. The flame characteristics of one of these, a Bunsen type burner, are compared before and after alteration (left and right, respectively). Both are burning gas at 5,000 Btu per hour. As a result of this work several manufacturers are redesigning their burners. The improved appliances will be available in the near future.

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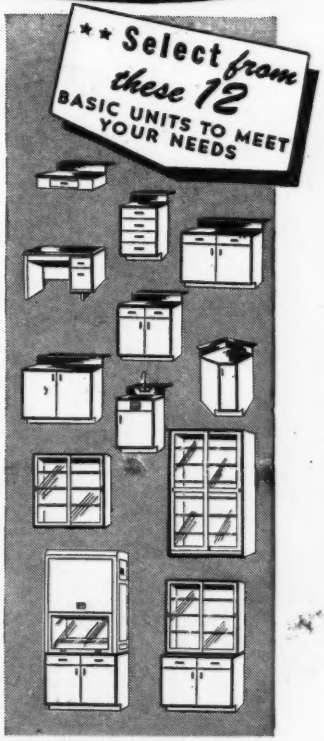
The unique Fisher Unitized Laboratory Furniture is adaptable to almost every need regardless of laboratory size or type of work to be done. It is featured by all-steel construction, Kemrock working surfaces, streamlined design and distinct advantages that eliminate engineering, manufacturing or installation delays.



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Aerial view below shows BLOCKSON'S vast 200 acre site where the entire BLOCKSON organization is coordinated into a closely knit group under intimate executive supervision for prompt service to American industry, large and small.

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- ☐ SODIUM SILICOFLUORIDE
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- ☐ CHLORINATED TRISODIUM PHOSPHATE
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- ☐ DISODIUM PHOSPHATE, ANHYDROUS
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Sodium Phosphates

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NEWS OF THE MONTH

New Construction

Tennessee Eastman Corp.'s search for a Southwest organic chemicals plant site (*CI Newsletter, February 1949*) is over. A large tract of land along the Sabine River near Longview, Tex., has been selected, and deeds are being taken. Basic raw materials for the company's cellulose acetate operations at Kingsport, Tenn., will be manufactured. With proximity to natural gas a factor in the selection, presumably acetylene will be made from this material for conversion into acetaldehyde, acetic acid, and acetic anhydride. Construction will begin as soon as engineering design is completed; late 1950 is the expected date of initial operation.

More fluoride chemicals—principally sodium fluoride, sodium bifluoride and high strength hydrofluoric acid—are on the way. The Aluminum Ore Co., wholly owned subsidiary of Aluminum Company of America, has just completed an ultramodern fluoride plant at East St. Louis, Ill. Replacing smaller facilities at a cost of $1 million, the new plant can make 10 million lbs. of fluorides per year on one-shift operation. Improved products at lower production cost can be expected within a few weeks.

Farmers in the Pacific Northwest will have an additional supply of superphosphate by early 1950. That's the date the Stauffer Chemical Co. has set for first production from its new Tacoma, Wash., plant on which construction is just beginning. Phosphate rock from Stauffer's Sage, Wyoming, properties and sulfuric acid from American Smelting & Refining Co.'s 100-ton acid plant at Tacoma will be the raw materials. Stauffer is taking all of A. S. & R.'s acid; will sell any not needed for superphosphate to Pacific Northwest industries.

A new soybean oil extraction plant with a rated daily capacity of 800 tons of soybeans has been started by A. E. Staley Mfg. Co. at Decatur, Ill. Construction, under contract to H. K. Ferguson Co., Cleveland, is to be completed next July. Part of a modernization program, the project will probably exceed $2.5 million in cost. Contract for installing machinery has not yet been awarded. Conversion to extraction in processing soybeans will not increase Staley's overall capacity, but will replace the less efficient expeller plant.

Washington

Two new Chemical Corps procurement districts have been recently established to implement the Chemical Corps Industrial Mobilization and Procurement Planning Program. The Atlanta Chemical Procurement District, 114 Marietta St., N.W., Atlanta, Ga., has as its territory North and South Carolina, Tennessee, Mississippi, Alabama, Georgia, and Florida. The Boston Chemical Procurement District, Boston Army Base, Boston, Mass., covers Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island.

Richard P. Carlton, elected president of Minnesota Mining and Manufacturing Co. He succeeds William L. McKnight, now chairman of the board.

The Atomic Energy Commission is negotiating with the Chemical Plants Div. of Blaw-Knox Construction Co., Pittsburgh, Pa., for a contract covering architect-engineer services for a materials testing reactor. The new reactor's primary purpose will be to test reactor construction materials under intense neutron bombardment.

Production of gasoline from coal at a cost that would raise current service station price but 3 to 4 cents a gallon is now possible, according to Bureau of Mines Director James Boyd. This statement was made in connection with publication of a new report on estimated plant and operating costs for coal hydrogenation. Sale of byproduct phenols, for which demand may be limited, might make the cost even lower for a few initial plants. A free copy of this report "Estimated Plant and Operating Costs for Producing Gasoline by Coal Hydrogenation," may be obtained from the Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.

Another recent development in synthetic fuel works was a test run on mining oil shale at the Bureau of Mines experimental mine near Rifle, Colo., which demonstrated that oil shale could be mined at a direct cost of 32.9 cents per ton. Average production per man day totaled 111 tons for underground labor and 92.7 tons for all labor.

Among recent Army contracts awarded to chemical companies in amounts in excess of $100,000 are the following: Monsanto Chemical Co., St. Louis, Mo., 721,000 lbs. of white phosphorous, $104,955; R. M. Hollingshead Corp., Camden, N. J., 89,000 gals. of dry cleaning solvents, $115,700.

New Companies

Marco Chemical Co. of Texas, Fort Worth, Tex., has been granted a charter for a 50-year term.

Mechanical Industries, Inc., is a new Pittsburgh, Pa., engineering firm whose activities will be concerned with ventilation, smoke, dust and fume control. Morton I. Dorfan is president and general manager.

Research Engineering and Manufacturing Co., New Bedford, Mass., will include in its activities patent investigations to determine the feasibility of manufacture, outright purchase of valid patents and manufacture of patented articles on a royalty basis. Where a company is not interested in using its own patents, it will introduce the patentee to interested parties.

Ownership Changes

Jas. P. Marsh Corp., Skokie, Ill., has purchased the Electrimatic Valve Div. of Simoniz Co., Chicago. Marsh will now manufacture and distribute all Electrimatic valves.

Two companies manufacturing research organic chemicals of high purity joined forces when the Matheson Co., Inc., East Rutherford, N. J. merged with Royal Organic Chemical Co., Roselle, N. J. All of Royal's operations have been transferred to the East Rutherford plant. With a combined listing of 3300 organic chemicals, the new organization claims practically complete coverage in the research organic chemical field.

Foreign Developments

Expanded detergent production in Britain is putting a damper on many Scottish projects in this field and is forcing many small British soapers to the wall. A

LOOK WHAT'S HAPPENING
on the Texas Coast

NEW HOUSTON QUARTERS FOR FERGUSON

The H. K. Ferguson Company has recently bought property in Houston and is drawing plans for an eight-story, $2,000,000 building of its own. Ferguson is one of the nation's top names in the design and construction of chemical and other industrial plants. It is the first firm in its field to erect its own office building here, and this move is indicative of the importance Houston is assuming as the new center of the nation's chemical industry.

NEW LINSEED OIL PLANT FOR HOUSTON

South Texas Cotton Oil Company, Technical Oil Division, has completed construction of a new building where linseed oil will be polymerized for use in the manufacture of synthetic drying oils. Production started August 15. 15,000 lbs. of linseed oil is being produced at a single charge, and output will go mainly to Texas paint and varnish manufacturers.

TALL TALE... BUT TRUE

"I suppose you account for the speed of the football players in Texas by claiming that when they were boys they ran down rabbits for the family table," an Eastern sports writer said.

"Not exactly," replied the Texas coach. "They not only had to be fast enough to catch the rabbit, but they had to be able to reach down while running alongside and feel him to see if he was plump enough to eat."

CALL THE ROLL...

of the big names in the chemical industry — Du Pont, Alcoa, Monsanto, Shell Chemical Corp., and many others —you'll find them all on the Texas Gulf Coast. Attractions are unlimited quantities of acids, bases, fresh water and cheap NATURAL GAS for fuel and hydrocarbons; reasons why your industry can profitably FOLLOW THE TREND TO TEXAS.

To help you find out more about the area we serve, we will gladly: (a) make a survey engineered to your company's needs; (b) supply you with any special information you require; (c) show you the coast country from Sabine to Rio Grande rivers — all in strictest confidence. Write, wire or telephone the Houston Pipe Line Company, Houston, Texas.

HOUSTON PIPE LINE CO.
Subsidiary of Houston Oil Company of Texas
GEO. A. HILL, JR., President
Wholesalers of Natural GAS

number of manufacturers had large-scale developments in the talking stage in Scotland, but Anglo-Iranian production and the marketing of northeast English production in Scotland has deterred them from any concrete action. In England, small manufacturers who had no trouble selling household soap and detergents during periods of shortages, now find that the big "name" firms are taking over much of this business.

Reduction in Israel's imports of fertilizers and basic chemicals is expected to follow start-up of operations at the Fertilizers and Chemicals, Ltd. plant near Haifa. Daily output of 55 tons of superphosphate and 25 tons of sulfuric acid has been achieved at the $1.5 million plant. A $3 million expansion which will provide a mixed fertilizer plant is planned. Some of the raw materials now being imported will eventually come from the Dead Sea. Palestine Economic Corp., New York City, is a leading advisor and investor in this new company.

Company Notes

Equipment Clearing House, Inc., Brooklyn, N. Y., is a new corporation rising out of the profit sharing plan of the First Machinery Corp. A substantial sum of money accumulated in F. M. C.'s profit sharing fund over seven years provided capital for the new company of which the stockholders are all former First Machinery Corp. employees. It will buy and sell process equipment for the chemical, food and allied industries.

Process Industries Engineers, Inc., Pittsburgh, Pa., has been appointed exclusive representative of Niagara Filter Corp., Buffalo, N. Y., for its line of Pressure Leaf Filters for the chemical and allied industries. It will cover western Pennsylvania, southern Ohio and part of West Virginia.

Merck & Co., Inc., is now conducting its export business under the name Merck (North America), Inc. This change from the name of P. W. R. Export Corp. is to indicate a closer relationship between the parent company and its overseas operation.

Celanese Corp. of America has begun volume production of isobutyl alcohol at its Bishop, Tex., chemical plant. Delivered price has been set at 12.5 cents a lb. in tankcars, 14 cents in carloads or drums.

Research Corp., New York, N. Y., has licensed Niagara Blower Co., New York and Buffalo, to manufacture dehumidifying and air conditioning equipment under its patents covering removal of moisture by use of hygroscopic liquid.

Bowen Engineering, Inc., has moved its business offices from Garwood, N. J., to North Branch, N. J. It will occupy temporary quarters until offices and laboratory buildings are completed on a recently purchased 100-acre tract.

The Davison Chemical Corp. and subsidiary companies report net income for the year ending June 30, 1949, at $2,275,884 after provision for taxes.

Jefferson Chemical Co., Inc.'s Port Neches plant has been shut down by a strike called by Oil Workers International Union (CIO). The company says that the issues involved are its right to determine the size of the plant working forces and whether it shall be required to negotiate upon Union demands for reduction of the work week from 40 to 36 hours, subject to threat of strike if not settled by negotiation.

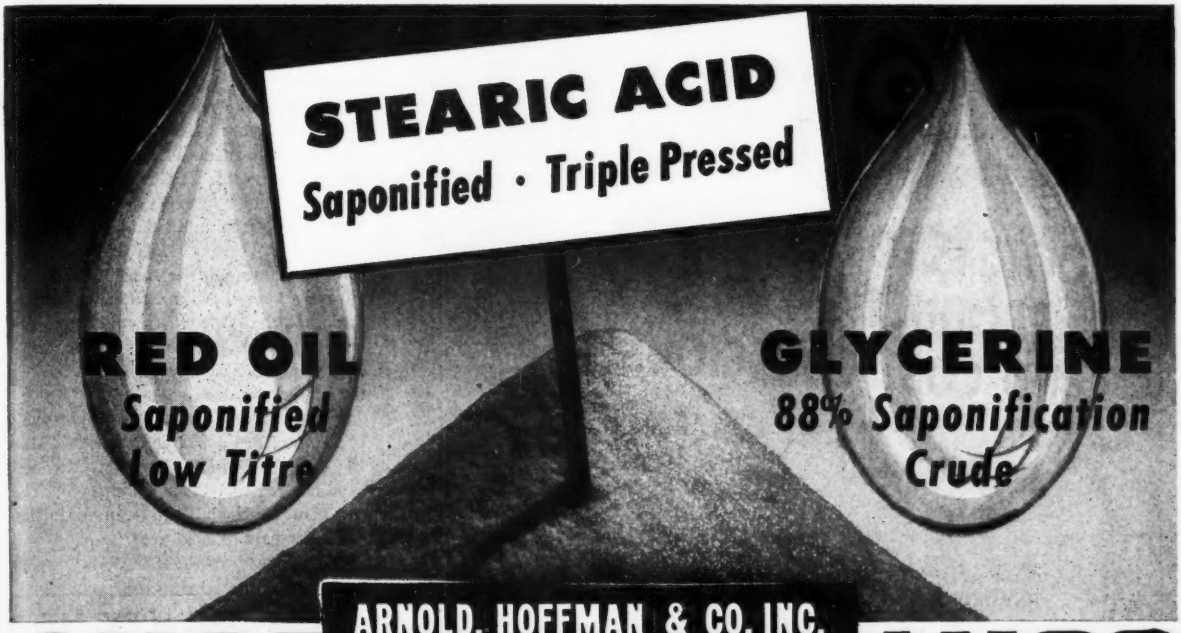
Donald H. Powers, new director of cosmetic research for the Richard Hudnut-DuBarry Division of William R. Warner & Co. He was formerly director of the Textile Chemical Department of Monsanto Chemical Co.

The Government anti-trust suit against E. I. du Pont de Nemours & Co., Inc., Remington Arms Co., Inc., and Imperial Chemical Industries, Ltd., of Great Britain, has been set for April 3, 1950. This suit, filed on January 6, 1944, charged the defendants with maintaining an international cartel agreement in violation of the Sherman Anti-Trust Act. Du Pont attorneys were prepared to appear October 3, the original date for the trial, but the Department of Justice attorney in charge of the case wasn't because he is tied up with another suit.

Elliott Co., Jeannette, Pa., has acquired Crocker-Wheeler Electric Manufacturing Co. Henceforth Crocker-Wheeler will operate as a division of Elliott.

Diamond Alkali's New York sales office is now located at 122 East 42nd St., New York 17, N. Y.

Foote Mineral Co., Philadelphia, Pa., has purchased a school building in Derwin, Pa., and will convert this three-story brick structure into a new research and development laboratory over the next three months. It is situated between the company's main office at Germantown, Philadelphia, and its plant at Exton, Pa. A separate building at the Exton plant is provided for pilot plant operations.



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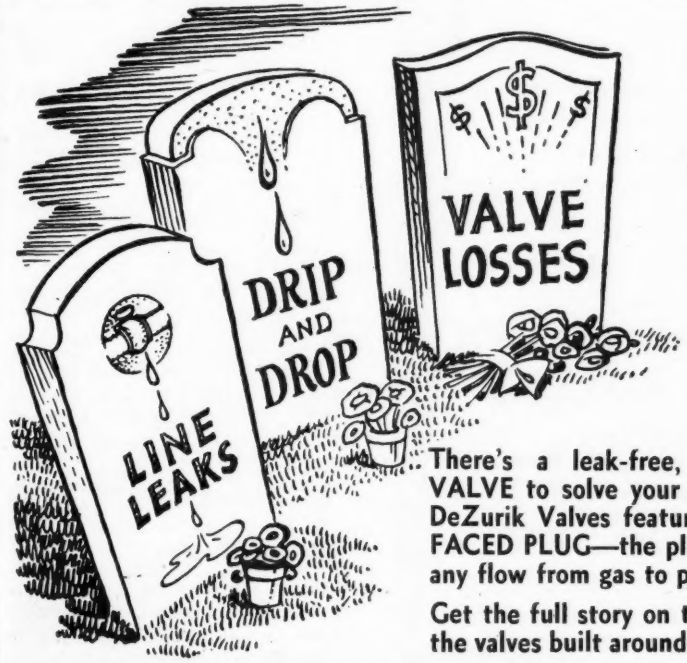

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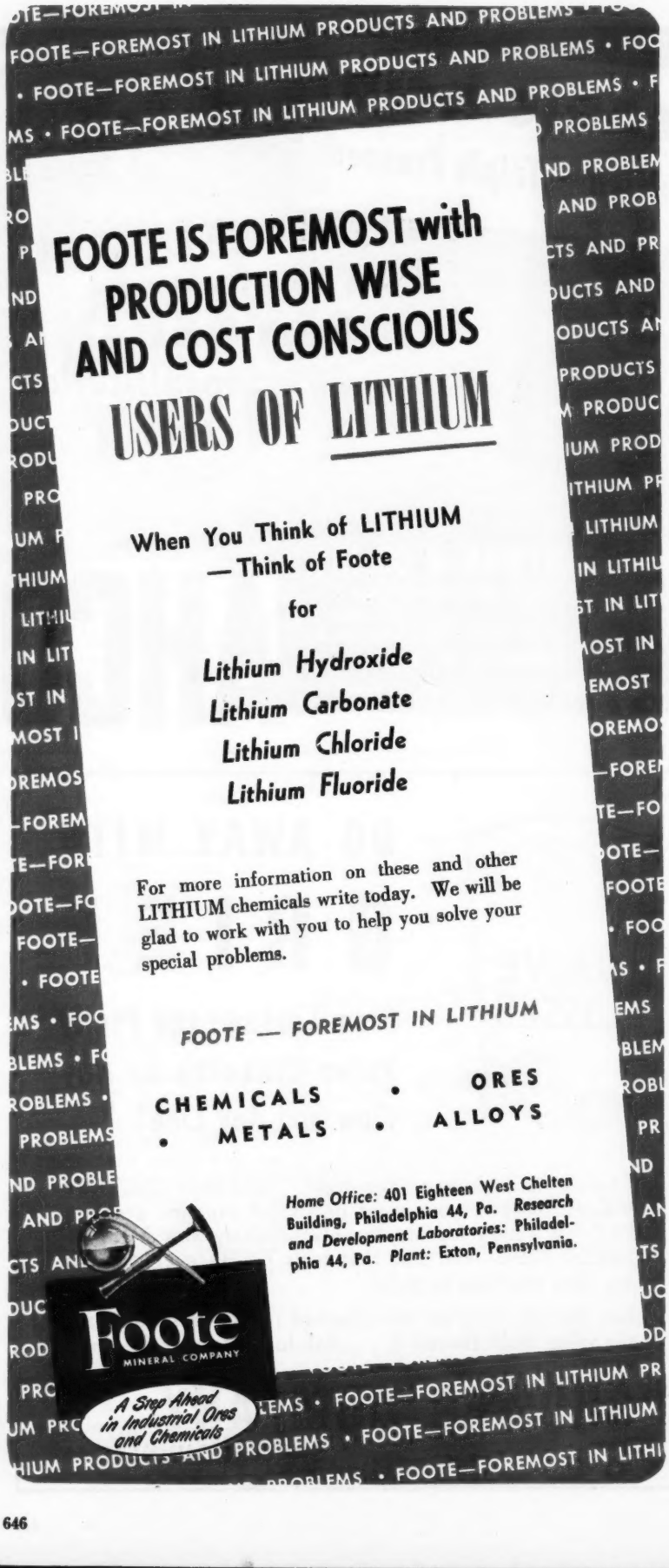
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Foote
MINERAL COMPANY
A Step Ahead in Industrial Ores and Chemicals

The combined Ammonia and Plastics Departments of the du Pont Co. will be known as the Polychemicals Department.

A group of synthetic non-ionic detergents from ethylene oxide will be the first products manufactured by Chemical Developments of Canada, Ltd., a new company jointly owned by General Aniline & Film Corp. and Standard Chemical Co., Ltd., of Canada. Other organic chemicals to follow will be based on General Aniline's know-how and patents. Authorized capital of the new company is $14 million. Stock ownership is divided 51% to 49%, with Standard Chemical holding the majority shares.

The du Pont Co.'s new Orlon plant at Camden, S. C., will be called the "May Plant" in honor of Benjamin M. May, retired head of the Rayon Department. The new plant is scheduled to be in production the latter part of next year.

CALENDAR *of* EVENTS

AMERICAN COUNCIL OF COMMERCIAL LABORATORIES, annual meeting, Miami, Fla., Dec. 5-7.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, annual meeting, William Penn Hotel, Pittsburgh, Pa., Dec. 4-7.

AMERICAN OIL CHEMISTS' SOCIETY, fall meeting, Edgewater Beach Hotel, Chicago, Oct. 31-Nov. 2.

AMERICAN PETROLEUM INSTITUTE, annual meeting, Chicago, Nov. 7-10.

AMERICAN PHARMACEUTICAL MANUFACTURERS ASSOCIATION, midyear meeting, Waldorf-Astoria Hotel, New York City, Nov. 28-30.

ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, annual meeting, Sheraton Hotel, New York City, Oct. 25.

EXPOSITION OF CHEMICAL INDUSTRIES, Grand Central Palace, New York City, Nov. 28-Dec. 3.

FEDERATION OF PAINT AND VARNISH PRODUCTION CLUBS, 27th annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., Nov. 3-5.

FOREST PRODUCTS RESEARCH SOCIETY, Northeast section, fall meeting, Hotel Statler, New York City, Oct. 31-Nov. 1.

NATIONAL ASSOCIATION OF INSECTICIDE AND DISINFECTANT MANUFACTURERS, annual meeting, Mayflower Hotel, Washington, D. C., Dec. 5-6.

NATIONAL FERTILIZER ASSOCIATION, fall meeting, Atlanta-Biltmore Hotel, Atlanta, Ga., Nov. 15-16.

NATIONAL PAINT, VARNISH AND LACQUER ASSOCIATION, 61st annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., Oct. 31-Nov. 2.

NATIONAL SAFETY COUNCIL, 37th national safety congress and exposition, Chicago, Oct. 24-28.

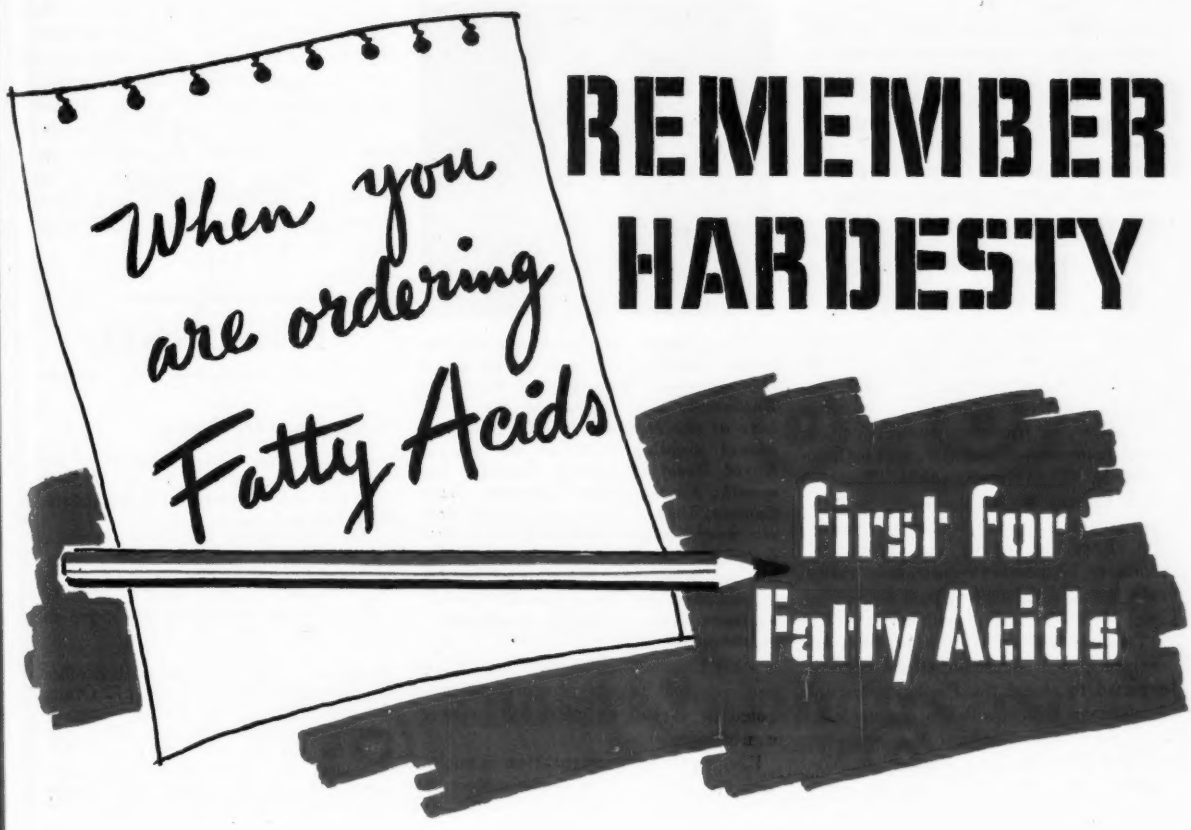
PACIFIC CHEMICAL EXPOSITION, San Francisco Civic Auditorium, San Francisco, Nov. 1-5.

PACKAGING INSTITUTE, 11th annual forum, Commodore Hotel, New York City, Oct. 24-26.

General Topics

Organization of the 22nd Exposition of Chemical Industries, to be held in Grand Central Palace, New York, November 28 to December 3, 1949, has been completed. All available exhibit space on four floors will be required to accommodate the list of exhibitors.

Exhibits will be composed of raw materials, machinery and products covering every recognized industrial and commer-



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No need to place your orders unreasonably far in advance. Our production is so geared that we can meet your orders on the delivery date you specify. Try Hardesty's "personalized" service on your next fatty acid order. You'll like the way we do business and the quality standards of our products we'll let speak for themselves.

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cial application of chemical materials from medicinal preparations and foodstuffs to such important manufactures as paper, plastics, dyes and many more. E. R. Weidlein, director of Mellon Institute, is chairman of the advisory committee of the 1949 exposition. The committee is composed of leaders in the major fields of interest which the exhibitors represent.

The first Plant Maintenance Show, and exposition devoted exclusively to cost reduction through improved installation, operation and maintenance of equipment and services in factories, warehouses and other plants, will be held in the Auditorium, Cleveland, O., Jan. 16-19, inclusive. Concurrently with the show, a four-day conference on plant maintenance methods will be held with L. C. Morrow, editor, **Factory Management & Maintenance,** as general chairman. There will be no charge for either exhibit or conference attendance. Advance registration cards may be obtained from Clapp & Poliak, Inc., 350 Fifth Ave., New York 1, N. Y.

Twenty thousand chemists, chemical engineers, and industrial executives are expected to attend the Pacific Industrial Conferences which will run concurrently with the Pacific Chemical Exposition at the San Francisco Civic Auditorium, November 1-5, 1949. There will be four-

Frank J. Curtis, vice-president of Monsanto Chemical Co. and president of the American Institute of Chemical Engineers, who addressed the members of the Institute briefly at the regional meeting held at the Mount Royal Hotel, Montreal, Canada, last month. Four hundred scientists from Canada, United States and Great Britain heard papers covering such subjects as recovery of manganese from low grade ore, evaporation of liquids in turbulent gas streams, and chemical engineering in a small development organization.

teen one- and two-day conferences presented by various technical and business organizations.

Electronic instrumentation in nucleonics and medicine will be the subject of a three-day conference to be held at the Hotel Commodore in New York on October 31, November 1 and 2. This is the second annual conference on this subject to be sponsored jointly by The Institute of Radio Engineers and The American Institute of Electrical Engineers. A special feature of the conference on the evening of November 1, will be a round-table discussion on "Evaluation of Radiation Hazards."

PERSONNEL

Company Officers

• John Tucker Ames of Nyack, New York, has been elected to the board of directors of **Tennants Consolidated Limited** in London.

Mr. Ames is the managing director of American-British Chemical Supplies, Inc., and is a director of Kay Fries Chemicals, Inc., Charles Tennant & Co. (Canada) Ltd., the Hackensack Water Co. and the Nyack Bank and Trust Co.

• **Louis L. Shapiro** has opened offices for chemical consulting work at 72 Orange St., Brooklyn, N. Y. For the past six years Mr. Shapiro has been plant manager for the Glyco Products Co., Inc., Brooklyn. He will specialize in esters, fatty acids, fats and oils, soaps, emulsifiers, waxes and tallow rendering.

Production

• F. Curtis Tucker has been named manager of purchases, Chemical Division, **General Electric Co.** He was previously with the Rohm & Haas Co.

Sales

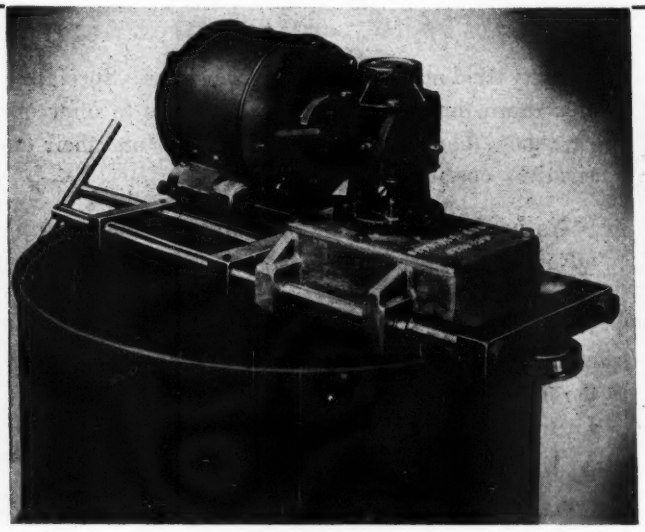
• Miller W. Conn has been named assistant manager of the chemical products department of **Phillips Petroleum Co.** Succeeding him as manager of the Perco division is Dale Fischbeck, service engineer of the division for the past two years.

• C. Benson Branch of the plastics division of **The Dow Chemical Co.,** has been named manager of the firm's Technical Service and Development Division. He will be responsible for market studies and the sale and development of new products as well as the performance of technical service for the firm's customers.

• J. W. Britton has been named head of the new Technical Service Division of **Surface Chemicals, Inc.,** research and manufacturing chemists. He will work in the field with industrial and commercial users in the application of new products being developed in the company's laboratories at McKees Rocks, Pa.

Research

• Arthur Dolnick, formerly of E. F. Drew Co., has been appointed research director, **Alrose Chemical Co.,** and Robert Feigin, formerly of Socony Vacuum Greenpoint Laboratories, is now in charge



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PORTABLE MOTORIZED HEAD CUTTER

Plug the "Schinker" Steel Drum Head Cutter into electrical outlet and start cutting; Removes the heads of all sizes of empty or loaded drums in two minutes right on the spot, leaving a safe turned-in flange.
Eliminates saw-tooth edges which tear workers' hands, does away with noisy hammer and chisel method or dangerous cutting with torch.
Built and designed to withstand hard use. Half H.P. enclosed motor mounted on transmission case. *Send for Folder*

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TERPENE HYDROCARBON SOLVENTS
STEAM DISTILLED PINE OILS
HEAT TREATED WOOD ROSINS
NAVAL STORES SPECIALTIES
PAPER SIZE, ALL GRADES
RESINOUS CORE BINDERS
SYNTHETIC PINE OIL
LIMED WOOD ROSINS
PALE WOOD ROSINS
BEREZ WOOD RESIN
ALPHA TERPINEOL
RESIN SOLUTIONS
P. E. ESTER GUM
TERPIN HYDRATE
FF WOOD ROSIN
ALPHA PINENE
BETA PINENE
GLOSS OILS
ESTER GUMS
TERPINEOL
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ROSIN OIL
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While not as efficient as a steam jet ejector, the AQUA-VACTOR becomes economical when the pressure of water is being dissipated for other process work. In such cases it may be possible to use the AQUA-VACTOR either as an ejector alone or as both an ejector and a condenser using water under pressure to operate the AQUA-VACTOR and using the exhaust from the AQUA-VACTOR for other processes.

The illustration shows a type SW EVACTOR using steam in the first stage and water in the second stage. Here the AQUA-VACTOR is used both as an ejector and as a condenser, handling air and, at the same time, condensing steam from the first stage. Of interest to engineers with corrosion problems, the steam stage in the illustration is constructed of carbon including the steam nozzle. The carbon is incased in case iron giving the equipment the strength of iron and the corrosion resistance of carbon.

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of application research. Harry Kroll, formerly in charge of organic research, has left to accept a National Cancer Research Fellowship.

• S. J. Rini, well-known in the field of fats and oils experimental work, has joined the **Kraft Foods Co.'s** research staff as chief of the Fat and Oil Research Section. For 11 years he has been a member of the research staff of Lever Brothers.

Samuel B. Applebaum (left), appointed manager of the Cochrane Corp.'s cold process water treating division, and David H. Jackson, vice-president of Croll-Reynolds Co., Inc., made general manager of the firm. Mr. Applebaum is also a vice-president of Cochrane's operating subsidiary, Liquid Conditioning Corp. Mr. Jackson has been with his company since 1930.

• Alfred G. Susie, chief chemist at Marbon Corp., Gary, Ind., for the past four and a half years, has been appointed supervisor of plastics research at **Armour Research Foundation, Illinois Institute of Technology.** He will be in charge of research projects dealing with plastics in the chemistry and chemical engineering department.

• Fred B. Speyer has been appointed product development specialist in the Chemical Department of **General Mills'** New Products Commercial Research organization. For the past two years, he has been director of Consulting Research Associates, Salem, Mass., a consulting service which he organized in 1947.

• Richard K. Richards, director of pharmacological research at **Abbott Laboratories,** has been appointed professor lecturer of pharmacology and therapeutics at the Northwestern University Medical School. Dr. Richards has been with Abbott since 1936 and has been a member of the faculty of the medical school since 1946.

Associations

• The Honor Scroll of the **American Institute of Chemists** has been presented to Otto Eisenschiml, president of the Scientific Oil Compounding Co. The presentation was made by L. H. Flett, national president of the Institute. Dr. Eisenschiml delivered his acceptance address on "The Responsibility of the Community to Its Chemists."

Obituaries

• **T. L. B. Lyster,** 70, former chief engineer of the Hooker Electrochemical Co., Niagara Falls, N. Y., died August 18th of a heart ailment after a short illness. At the time of his death, Mr. Lyster was a consulting engineer for Hooker.

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Gentle as a Lamb . . .

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100% active aromatic polyglycol ether. This wholly anhydrous amber liquid is miscible and compatible with quaternary ammonium compounds in any proportions. Readily adsorbed on alkaline carriers such as TSP, TSPP, Glauber's Salts, etc. Suitable for dry detergent sanitizer powders. Effective in very hard waters . . . works well under varying pHs and temperatures.

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Industrial Division — Jersey City 2, N. J.

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Equipment Manufacturers Addresses

(See page 533)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Louis Allis Co., 320 E. Michigan St., Milwaukee 7, Wis.
Alsop Engr. Co., Milldale, Conn.
American Air Filter Co., First & Central Aves. Louisville 8, Ky.
American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Hard Rubber Co., 11 Mercer St., New York 13, N. Y.
American Instrument Co., Inc., 8010-8020 Georgia Ave., Silver Spring, Md.
American Machine & Metals, Inc., 48 Thomas St., E. Moline, Ill.
American Meter Co., Inc., 49 E. 41st St., New York, N. Y.
American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.
Anders Chemical Corp., 26 Poplar St., E. Rutherford, N. J.
V. D. Anderson Co., 1935 W. 96th St., Cleveland 2, O.
Anemostat Corp. of America, 10 E. 39th St., New York 16, N. Y.
Ansul Chemical Co., Marinette, Wis.
Armstrong Machine Wks., Three Rivers, Mich.
Askania Regulator Co., 1603 S. Michigan Ave., Chicago 16, Ill.
Automatic Control Co., 1005 University Ave., St. Paul 4, Minn.
Automatic Temperature Control Co., 5212 Pulaski Ave., Philadelphia 44, Pa.
Automotive Rubber Co., 8603 Epworth Blvd., Detroit 2, Mich.
Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland, O.
Barnstead Still & Sterilizer Co., 2 Lanesville Terr., Forest Hills, Boston 31, Mass.
Bar-Way Mfg. Co., Stamford, Conn.
Belfield Valve Div., Minneapolis-Honeywell Regulator Co., 221 Fourth Ave., New York 3, N. Y.
Bendix Aviation Corp., Taylor Ave. at Lock Raven, Towson, Baltimore, Md.
Bin-Dicator Co., 14615 E. Jefferson Ave., Detroit 15, Mich.
Bird Machine Co., South Walpole, Mass.
Blackmer Pump Co., Grand Rapids, Mich.
Blaw-Knox Co., 2042 Farmers Bank-Bldg., Pittsburgh, Pa.
Bowen Engineering Co., North Ave., Garwood, N. J.
Bowser & Co., Fort Wayne 2, Ind.
Bowser, Inc., Terryville, Conn.
Branson Instruments, Inc., Joe Hill Rd., Danbury, Conn.
The Bristol Co., Waterbury 91, Conn.
Brooks Rotameter Co., Lansdale, Pa.
Brown Instrument Div., Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa.
Buffalo Meter Co., 2719 Main St., Buffalo 2, N. Y.
Buflovak Equipment Div., Blaw-Knox Co., 1548 Fillmore Ave., Buffalo, N. Y.
Cambridge Wire Cloth Co., 940 Washington Blvd., Cambridge, Md.
Chicago Blower Corp., 4558 Congress St., Chicago 23, Ill.
Clapp Instrument Co., Tracy Circle, Webster, Mass.
Clark Equipment Co., Battle Creek, Mich.
Clark Mfg. Co., 1830 E. 38th St., Cleveland 14, O.
Climax Engineering Co., Box 1529, Tulsa, Okla.
Cochrane Corp., 17th St. & Alleghany Ave., Philadelphia 32, Pa.
Colloid Equipment Co., 50 Church St., New York 7, N. Y.
Cook Electric Co., 2700 N. Southport Ave., Chicago, Ill.
Coral Designs, Box 248, Forest Hills, N. Y.
Corning Glass Wks., Corning, N. Y.
Cowles Co., Inc., Cayuga, N. Y.
Crane Co., 8365 S. Michigan Ave., Chicago 5, Ill.
The Day Co., 820 Third Ave., NE, Minneapolis, Minn.
Denison Eng. Co., 1160 Dublin Rd., Columbus, 16, O.
Denver Equipment Co., Dept. 3914, 1400 17th St., Denver 17, Colo.
Deublin Co., Northbrook, Ill.
DeZurik Shower Co., Sartell, Minn.
Distillation Products, Inc., Vacuum Equipment Div., Rochester, N. Y.
Dorr Co., 568 Lexington Ave., New York, N. Y.
Dow Chemical Co., Midland, Mich.
Drinkwater, Inc., Spring & Madison Sts., Waukegan, Ill.
Duriron Co., Inc., Dayton, Ohio
Eastern Industries, Inc., 296 Elm St., New Haven, Conn.
Eco Engineering Co., Dept. 13, 12 New York Ave., Newark 1, N. J.
Economy Pumps, Inc., Div. of Hamilton-Thomas Corp., Hamilton, O.
Edward Valves, Inc., 1234 W. 145th St., E. Chicago, Ind.
The Electric Auto-Lite Co., Toledo 1, O.
Electric Steel Foundry Co., 2141 25th Ave., Portland 10, Ore.
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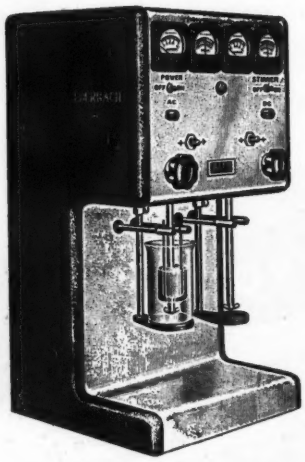
(*Turn to page 661*)



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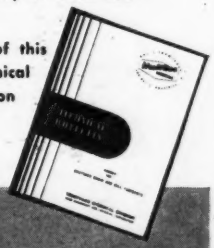

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CHEMICAL MARKETS

Lower Production for Inorganic Chemicals

United States production levels of industrially important inorganic chemicals for June 1949 were generally lower than for May 1949 or June 1948, according to the Bureau of the Census. Compared with May 1949, increases were reported for 9 of the 35 chemicals included in the Bureau's continuous monthly survey, while decreases were reported for 24. Twelve of the 35 chemicals were produced in larger quantities during June 1949 than during the same month of 1948 while 21 were produced in smaller volume.

Although June 1949 figures for the "heavy volume" inorganic chemicals, synthetic anhydrous ammonia, ammonium nitrate, chlorine, nitric acid, phosphoric acid and sulfuric showed declines from May 1949 totals, production for all of these chemicals exceeded the levels attained in June 1948. The amount of caustic soda and sodium sulfate produced in June 1949 was less than the May 1949 and June 1948 quantities. The usual seasonal production gains for carbon dioxide, both liquid and solid (dry ice) were reflected in the June figures.

Coal Chemicals Output Up In Coke Record Year

The annual canvass of U. S. coke producers conducted by the Bureau of Mines showed that production of principal coal chemicals increased in 1948, a year in which more coke was produced than at any other time in the industry's history.

Tar production increased 2,580,626 gallons over 1947, the total being 738,755,106 gallons; ammonium sulfate or equivalent, 34,763,170 pounds, total being 1,859,386,041 pounds; gas, 23,590,346 M cu. ft., total being 994,852,626 M cu. ft.. and crude light oil, 1,110,602 gallons, total being 256,089,065. Although these increases in production were registered, yields per ton of coal carbonized decreased because of the poor quality of the coal charged.

Production of coke in 1948 amounted to 74,861,928 net tons, 2 per cent more than in 1947 and 1 per cent more than the wartime peak in 1944. Output of beehive coke declined 109,730 tons, but oven-coke plants produced 1,525,808 tons more than in 1947. Yields of coke per ton coal dropped from 69.91 to 69.60 as a result of purchases of a large proportion of inferior coal in the first part of 1948.

Market Review

After a short period of slight decline in chemical market price levels, in which even fats and oils were on the downside, a slight upturn featured the end of the summer season. There was a definite pickup in demand, but most orders were small and of the rush variety. Such a buying policy seemed characteristic of chemical consumers who, perhaps feeling secure that there were ample supplies available, decided to let producers carry inventory. With improvement noticeable in such industries as textiles, paint, rubber, leather, and plastics, producers looked forward to better markets in the fall.

Among heavy chemicals, chlorine continued to stand out as the only one not in easy supply. The Dow Chemical Co.'s plan to establish a terminal at Carteret, N. J., to distribute its Texas-made caustic indicates the vigorous marketing steps that must be taken to move the large supplies of that material. Export demand for alkalies is off, and prices are at 1939 level.

News was both good and bad in coal-tar chemicals. The good was a decided and sudden increase in demand, particularly for phthalic anhydride; the bad was the threat of a steel strike which if prolonged, would threaten supplies. The pickup in phthalic was traced to alkyd resin producers who are finding better markets for coatings as heavy durable goods are beginning to move. Both xylol and tolulol were firm and active, and benzene was about in balance. Pricewise a 1¾¢ per pound reduction in coaltar refined naphthalene for mothproofing was the outstanding development.

A good demand for vegetable waxes carried through the month, and some price adjustments were made. After several increases, carnauba No. 1 was being offered as high as $1.14 per pound, and N. C. No. 3 was 82½-83¢. Carnauba was reportedly in good supply in Brazil, but it was not being freely offered. Mexican candelilla was in ample supply with the crude at about 48¢ per pound and the refined at 49¢.

Throughout the month there was a continued firming up of prices in essential oils with the market active, and higher levels being established. This was generally attributed to higher prices abroad, since heavy buying prevailed in those markets.

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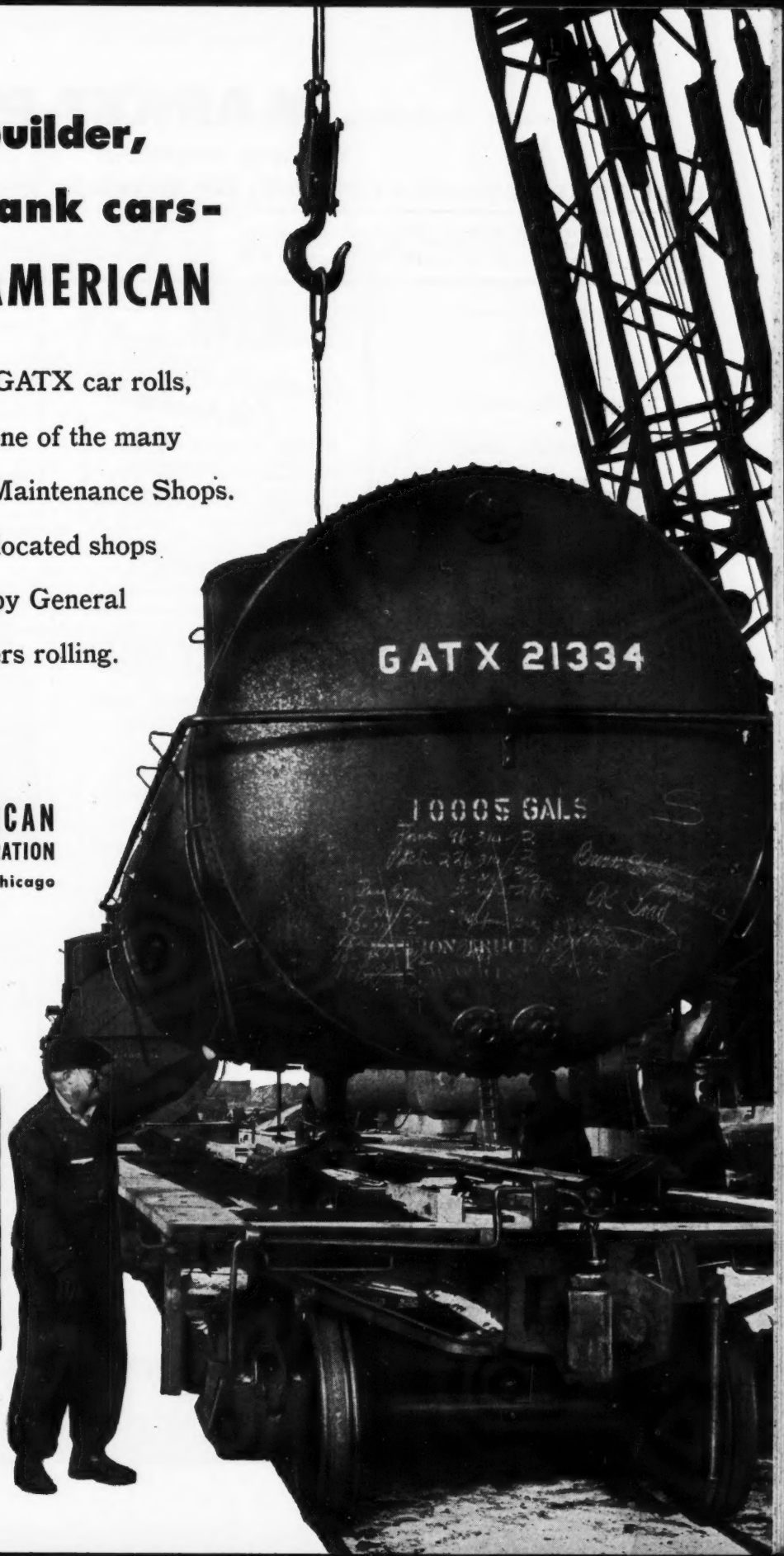

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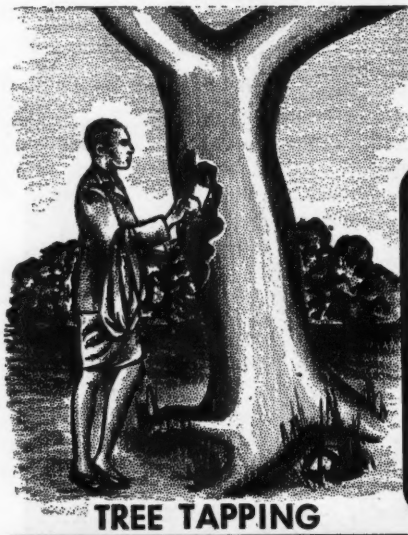

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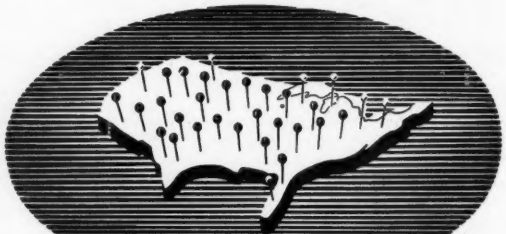

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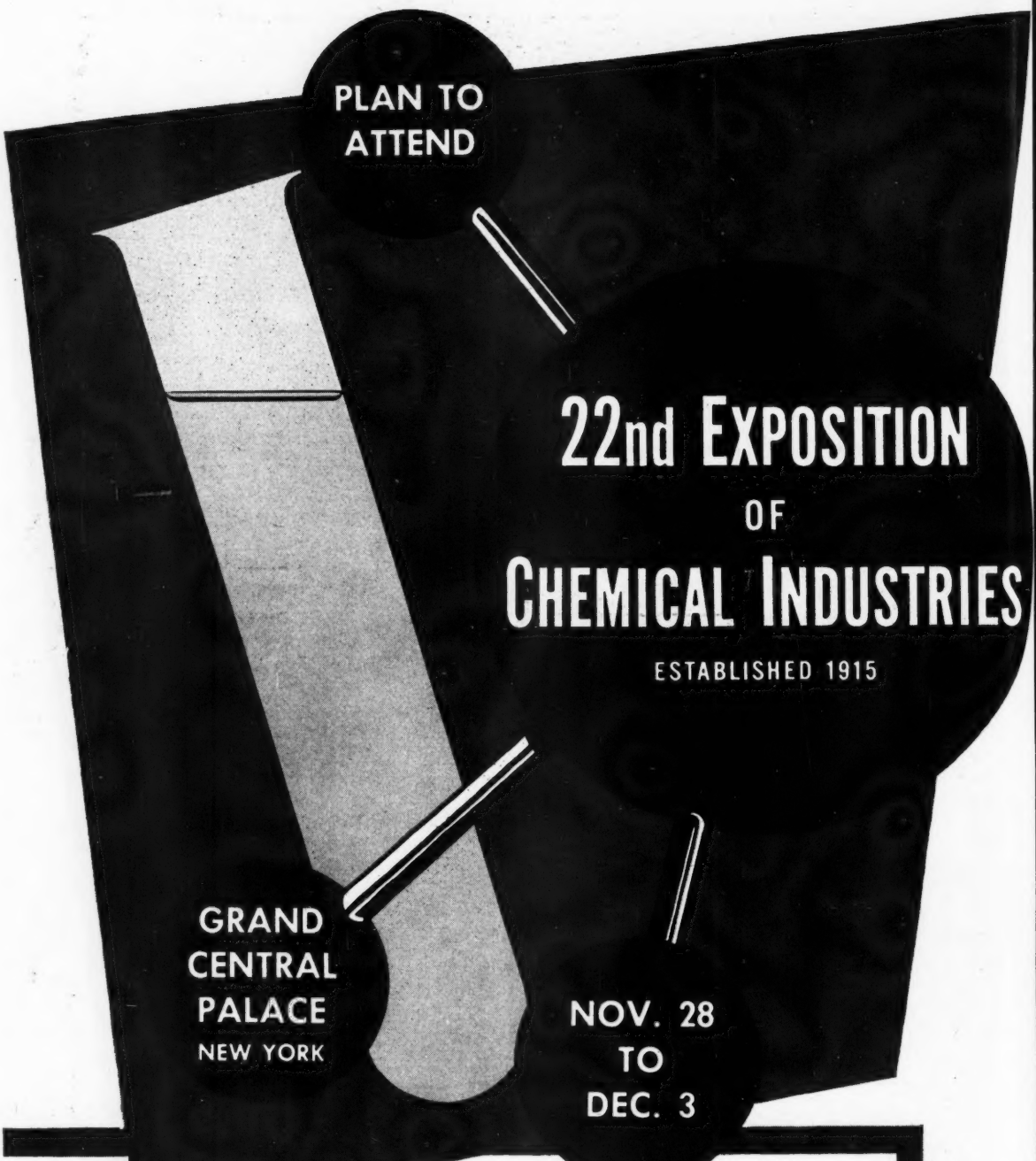

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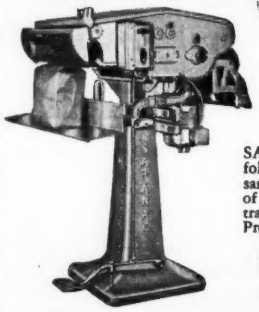

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U. S. Patents from Official Gazette—Vol. 623, Nos. 1, 2, 3, 4, (June 7-June 28)

Agricultural

Composition for destroying weeds comprising an aqueous dispersion of a compound conforming to the general formula $Ar.O.CH_2.Y$, in which Ar is selected from the group consisting of the phenyl radical, the naphthyl radical, and such radicals containing also at least one substituent selected from the methyl radical and halogen atoms, and Y is selected from the group consisting of the carbonamide, nitrile, and carboxylic ester radicals, the carboxylic ester being derived from an alcohol from the group consisting of aliphatic and cycloaliphatic alcohols containing not more than 10 carbon atoms. No. 2,472,347. Wilfred Archibald Sexton (to Imperial Chemical Industries Ltd.).

Moth-proofing composition including a solution of di-(2-chloro-cyclohexyl)-sulfide in a volatile organic solvent. No. 2,472,755. Harold W. Moll (to Dow Chemical Co.).

Fungus-inhibiting lacquer comprising a fungicide consisting of orthocresyl-azo-diamino benzene hydrochloride, and tetra-bromo-ortho-cresol and clear lacquer. No. 2,472,847. Walter S. Osborne.

Fumigating soil by depositing below the surface a mixture of ethylene bromide and naphtha. No. 2,473,984. Jack M. Bickerton (to Innis, Speiden and Co.).

Cellulose

Production of color stable compositions of matter having a basis of a cellulose ether and substantially resistant to color changes under the action of heat or light which comprise subjecting a cellulose ether in particle form to extraction with an aqueous solution of a lower aliphatic alcohol and then incorporating a color-stabilizing agent, selected from the group consisting of octyl sulphite, decyl sulphite and triethylcitryl sulphite, with said extracted cellulose ether. No. 2,472,227. Walter D. Paist and Frank Berardinelli (to Celanese Corp. of America).

Preparing oxidized nitrated cellulose by treating bone-dry cellulose with an anhydrous mixture of nitrogen dioxide, nitric acid, and a halogenated hydrocarbon. No. 2,472,591. William O. Kenyon and William F. Fowler, Jr. (to Eastman Kodak Co.).

Washing cellulosic fibers to remove calcium, magnesium, sodium and other cations by washing with salt-bearing industrial water acidified with an inorganic acid. No. 2,472,877. John William Allquist (to Celanese Corp. of America).

Increasing abrasion resistance, stiffness, and tensile strength and decreasing moisture absorptivity of cellulosic yarns by impregnating said cellulosic material with a strong hydroxide, removing excess solution immersing the impregnated material in a solution of acrylonitrile in an inert water immiscible organic solvent, separating material and solution, and removing acrylonitrile and strong hydroxide remaining in the treated material. No. 2,473,308. James W. Stallings (to Rohm & Haas Co.).

Preparing regenerated cellulose by mixing cellulose, N_2O_4, an inert solvent compatible with N_2O_4 containing water, until solution of the cellulose occurs followed by imparting a physical form to the solution and setting the so-formed solution. No. 2,473,473. Gordon D. Hiatt and Carlton L. Crane (to Eastman Kodak Co.).

Delaying the aging of alkali cellulose by aging in the presence of sodium trithiocarbonate. No. 2,473,954. Guillaume M. A. Kayser (to American Enka Corp.)

Lyophilic aggregate of independent fibers of a cellulose having a carboxyl content between about 2% and 23% selected from the class consisting of oxidized cellulose and partially neutralized oxidized cellulose, the oxidized cellulose of said fibers being at least partially in the form of its reaction product with a high molecular weight quaternary ammonium salt wetting agent. No. 2,474,306. Leonard Doub (to Parke, Davis Co.).

Ceramics

Cementitious refractory consisting of ground fire clay, nitre cake, salt, silica sand, iron filings and water. No. 2,472,206. Lz Elsworth Greene.

Optical glass consisting of titanium oxide, lead oxide, and boron oxide. No. 2,472,447. Kuan-Han Sun (to Eastman Kodak Co.).

Optical glass consisting of the heat-reaction product of silica, thallous oxide, and titanium dioxide. No. 2,472,448. Kuan-Han Sun (to Eastman Kodak Co.).

Coatings

Stirring finely divided metallic particles in a hot organic solvent solution of solid polymer consisting of polymerized ethylene, cooling to coat the metallic particles with a film of said polymer, and dispersing the coated metallic particles in a filmforming vehicle other than said polymer, said film-forming vehicle being a non-solvent for said polymer and being capable of drying to a continuous coherent solid film. No. 2,472,680. Burt Carlton Pratt (to E. I. du Pont de Nemours & Co.).

Weather resistant composition consisting of: a rubbery butadiene-acrylonitrile copolymer, mixed with a resinous polymer of vinyl acetate; carbon black; dioctyl phthalate; tricresyl phosphate; dibenzyl sebacate; zinc oxide; sulfur; benzothiazyl disulfide; phenyl beta naphthylamine; paraffin wax; stearic acid. No. 2,474,309. Philip Tucker Gidley (to Standard Development Co.).

Detergents

Preparing soap from a vegetable oil containing gamma tocopherol by treating the vegetable oil with hydrogen gas in the presence of a metallic hydrogenating catalyst and a hydroperoxide, and saponifying the hydrogenated oil, the amount of hydroperoxide present during hydrogenation being sufficient to inhibit the formation of gamma tocopherol orthoquinone. No. 2,473,154. Willy Lange and Robert G. Folzenlogen (to Procter & Gamble Co.).

Stable water softening detergent consisting of a mixture of alkali metal polyphosphate coated substantially entirely with a material chosen from the group of alkali metal carbonates and alkali metal non-polyphosphate phosphates, and alkali metal metasilicate. No. 2,473,822. Edward A. Robinson (to Diamond Alkali Co.).

Germicidally active detergent composition for use in water containing water hardening constituents consisting of a mixture containing an alkali metal salt of ethylene diamine tetraacetic acid and a quaternary ammonium salt of ethylene diamine tetraacetic acid, balance consisting of simple alkali metal detergent salts of the group consisting of phosphates, carbonates, silicates, borates, sulfates and mixtures thereof. No. 2,474,412. Frederick C. Bersworth.

Dyes & Pigments

Metallizable monoazo dipyrazolone dyestuffs. No. 2,472,109. Peter Hindermann (to J. R. Geigy A. G.).

Disazo dyestuffs. No. 2,472,215. Hans Ischer (to Sandoz Ltd.).

The new dyestuff 4:7-dichloro-(2:1)-naphthindole-2:2'-(2':1')-naphthathionaphthene indigo. No. 2,472,356. Donald Graham Wilkinson (to Imperial Chemical Industries Ltd.).

Pyrimido-2'-cyanine dyes. No. 2,472,565. Leslie G. S. Brooker, Walter F. Holcomb and Clarence Kenneth Banks (to Eastman Kodak Co.).

Production of dye intermediates. No. 2,472,666. Robert Mitchell Leekley (to E. I. du Pont de Nemours & Co.).

Quinoneimine dyes from hydroxy-benzamidobenzaldehyde and hydroxybenzsulfamido-benzaldehyde acetals of lower alkanols and 1,2-and 1,3-alkanediols. No. 2,472,911. Elmore Louis Martin (to E. I. du Pont de Nemours & Co.).

Azomethine dyes from acylacetamidobenzaldehyde acetals. No. 2,473,913. David Malcom McQueen (to E. I. du Pont de Nemours & Co.).

Metallized tetrakisazo dyes. No. 2,472,965. Walter Wehrli (to Sandoz Ltd.).

Converting a vat dyestuff of the group consisting of naphthoylene (1,8,4,5)-bis-imidazoles and perylene-3,4,9,10-tetracarboxylic acid diimides into very finely divided particles by forming a slurry of the dyestuff with sulfuric acid agitating until conversion of the dyestuff to the substantially insoluble sulfate is complete, and hydrolyzing to the dyestuff. No. 2,473,015. John F. Cullinan and Lawrence D. Lytle (to American Cyanamid Co.).

Color former consisting of a hydrophilic ether of a hydrolyzed aliphatic mono-olefin/vinyl ester interpolymer having a plurality of color former nuclei each nucleus being attached to the chain atoms of said interpolymer through a—CH_2—O—linkage. No. 2,473,403. David Willcox Woodward (to E. I. du Pont de Nemours & Co.).

Monazo dyestuff being the diazo of a para nitro aniline which is devoid of sulfonic acid, carboxylic acid and cyano groups coupled with the sulfuric acid ester of an N-hydroxyalkyl-N-aryloxy-alkyl-aniline in which alkyl of both the hydroxyalkyl and the aryloxyalkyl groups has 2 to 5 carbons and aryloxy of the aryloxy-alkyl group is from the group consisting of phenoxy, tolyloxy, chlorophenoxy and naphthoxy, said coupling component being devoid of sulfonic acid and carboxylic acid groups, said coupling being para to the nitrogen atom. No. 2,473,885. Basil Jason Heywood (to Imperial Chemical Industries Ltd.).

Anthrimide-carbazole dyestuffs. No. 2,473,949. Hermann Hauser and Max Bommer (to Swiss firm of Ciba Ltd.).

Anthrimide-carbazole dyestuffs. No. 2,473,950. Hermann Hauser and Max Bommer (to Swiss firm of Ciba Ltd.).

Secondary disazo dyestuff which in the form of its sodium salt is 1,7-disazo-8-hydroxy-naphthalene-4-sodium sulfonate wherein the azo group in the 1-position is linked to an aceto-acetanilide radical, and the azo group in the 7-position is linked to a nitrophenol in the 2-position thereof, said nitrophenol being elected from the group consisting of 4-nitrophenol, 6-nitro-4-sulfophenol and 4-nitro-6-sulfophenol. No. 2,474,024. Carl Ivar Anderson (to Allied Chemical & Dye Corp.).

Applying at least one identifying colored stripe to the exterior of a sheath of resinous material from the class consisting of polyvinyl chloride and copolymerized vinyl chloride-vinylacetate resins by applying to the exterior a stripe consisting of a highly volatile liquid ketone which contains in solution an organic dye. No. 2,474,088. Richard J. Brown (to Anaconda Wire & Cable Co.).

Diphenylamine sulfonamide dyestuffs. No. 2,474,333. George W. Seymour and Victor S. Salvin and Wilford Donald Jones (to Celanese Corp. of America).

Cyanine dyestuffs. No. 2,474,426. John David Kendall, Harold Gordon Suggate and Henry Walter Wood (to Ilford Ltd.).

Monoazo dyestuffs. No. 2,474,736. Basil Jason Heywood (to Imperial Chemical Industries Ltd.).

Monoazo dyestuffs. No. 2,474,737. Basil Jason Heywood (to Imperial Chemical Industries Ltd.).

Printing difficultly oxidizable sulfuric ester salts of leuco vat dyestuffs of the indigoid type by printing the ester salts with dichromates and in the presence of ananiline sulfonic acid radical, substituted by at least one aliphatic hydrocarbon radical containing not more than one double bond, and developing the print with acid vapors. No. 2,474,785. William B. Hardy and Elizabeth M. Hardy (to American Cyanamid Co.).

Explosives

Explosive composition comprising a mixture of ethylene dinitramine and trinitrotoluene. No. 2,472,105. George C. Hale.

Inorganic

Converting hydrocarbon hydrosulfides to neutral sulfur substances com-

prising contacting said hydrocarbon hydrosulfides in an aqueous alkaline solution with an oxygen-containing gas in the presence of a small amount of an amino-hydroxy-nitrobenzene oxidation catalyst. No. 2,472,473. Lloyd C. Fetterly (to Shell Development Co.).

In separation of hydrogen chloride from a mixture containng said hydrogen chloride in admixture with an olefin by fractionating said mixture the improvement which comprises effecting said fractionation in a fractionating zone in which substantially all surfaces contacting said mixture undergoing fractionation are essentially only of nickel thereby effecting said fractionation in the absence of interaction of said hydrogen chloride and olefin. No. 2,472,610. Alan C. Nixon, David C. Lehwalder and Harry A. Cheney (to Shell Development Co.).

Preparation of a hydrogel comprising silica and alumina which comprises preparing a silica-magnesia hydrogel, soaking in a solution of a salt of aluminum to cause the magnesia of the hydrogel to react with the aluminum salt to form a silica-alumina hydrogel and a magnesium salt and washing. No. 2,472,830. Edward A. Hunter (to Standard Oil Development Co.).

Preparation of a hydrogel comprising silica and an oxide of a metal, other than magnesium, selected from groups 2, 6 and 7 of the periodic table by admixing a silica sol and an aqueous slurry of magnesia, converting the resulting mixture to a silica-magnesia hydrogel, contacting with a solution of a salt of a metal, other than magnesium, selected from groups 2, 6 and 7 of the periodic table to permit the magnesia of the hydrogel to react with the said metal salt to form a silica-metal oxide hydrogel and a magnesium salt. No. 2,472,831. Edward A. Hunter and Charles N. Kimberlin, Jr. (to Standard Oil Development Co.).

Preparation of a hydrogel comprising silica and an oxide of a metal of group 4 of the periodic table by admixing a silica sol and an aqueous slurry of magnesia, converting to a silica-magnesia hydrogel, contacting with a solution of a salt of a metal selected from group 4 of the periodic table for a sufficient period of time to permit the magnesia of the hydrogel to react with the said metal salt to form a silica-metal oxide hydrogel and a magnesium salt, and washing. No. 2,472,832. Edward A. Hunter and Charles N. Kimberlin, Jr. (to Standard Oil Development Co.).

Preparation of a hydrogel comprising silica and an oxide of a metal of group 8 of the periodic table by admixing a silica sol and an aqueous slurry of magnesia, converting the resulting mixture to a silica-magnesia hydrogel, contacting with a solution of a salt of a metal selected from group 8 of the periodic table to permit the magnesia of the hydrogel to react with the said metal salt to form a silica-metal oxide hydrogel and a magnesium salt, and washing. No. 2,472,833. Edward A. Hunter and Charles N. Kimberlin, Jr. (to Standard Oil Development Co.).

Preparing synthetic silica-metal oxide gels for use in the catalytic conversion of hydrocarbon oils. No. 2,472,834. Robert E. Schexnailder, Jr. and Edward A. Hunter (to Standard Oil Development Co.).

Preparing a stable colloidal trisulphide of arsenic by admixing ammonium sulpharsenate with colloidal sulphur, and treating with formaldehyde to fix the ammonia radical of the sulpharsenate compound to produce a colloidal arsenic trisulphide stabilized with colloidal sulphur. No. 2,473,110. Fernando F. Schwartz.

In producing a pure magnesium compound from crude magnesium ores involving the leaching of a basic magnesium substance with an acidic chloride solution, the steps which comprise subjecting the impure leach liquor to a preliminary partial purification then treating the partially purified solution with hydrogen chloride to precipitate pure crystalline hydrated magnesium chloride, removing the crystalline precipitate, calcining the crystalline precipitate to liberate most of the water and some of the hydrogen chloride, then calcining the residue at a high temperature to liberate the remaining combined chlorine as hydrogen chloride, and recovering pure magnesium oxide. No. 2,473,534. Rex R. Lloyd.

Producing depolarizing manganese dioxide by starting from a manganese dioxide of low depolarizing power, reducing this dioxide by heating into at least one manganese oxide containing a proportion of oxygen lower than that existing in manganese dioxide and higher than that existing in bivalent manganese oxide, forming an aqueous suspension of the manganese oxide thus obtained, and treating this suspension with gaseous chlorine. No. 2,473,563. Maurice Beja and Rene Albert Loisy (to Compagnie de Produits Chimiques et Electrometallurgiques Alais Froges et Camargue).

Producing potassium tungstate as a water soluble metathetical compound of the tungsten component of scheelite, and the potassium component of feldspar. No. 2,473,703. Henry Seymour Colton and Robert W. Frischmuth and Raymond L. Knowles.

Cleaning metal hydrogenation catalysts with alcoholic caustic solution. No. 2,473,880. Marion H. Gwynn (to Allied Chemical & Dye Corp.).

Silicate-titanate phosphors. No. 2,473,960. Ferdinand Anne Kroger (to Hartford National Bank and Trust Co.).

In making hydrogen sulphite, the step which comprises intermittently introducing sulphur into a vaporizing chamber and intimately admixing with a stream of hydrogen. No. 2,474,066. Louis Preisman and Charles F. Hobson (to Barium Reduction Corp.).

Reacting a halohydrocarbon of the group consisting of alkyl halides and aromatic halohydrocarbons and a polyhalopolysilane containing a silicon-silicon linkage. No. 2,474,087. Arthur J. Barry and John W. Gilkey and Lee De Pree (to Dow Chemical Co.).

Calcium silicate phosphor. No. 2,474,193. James H. Schulman (to Sylvania Electric Products, Inc.).

Producing an especially reactive lime by heating calcium hydroxide. No. 2,474,207. Wheeler G. Lovell, Verle A. Miller, Maurice J. Mulligan and Hart K. Lichtenwalner (to General Motors Corp.).

Preparing an aromatizing catalyst consisting of a group VI metal oxide supported on a zinc-aluminate spinel. No. 2,474,214. James F. Black (to Standard Oil Development Co.).

Preparing a catalyst adapted for the reforming of hydrocarbons by interacting an acidic solution of a zinc salt with a basic solution of an alkali metal aluminate to form a zinc aluminate precipitate, separating, washing, drying, thereafter calcining and incorporating a group VI metal oxide into said precipitate to form a catalyst comprising a zinc aluminate spinel and a group VI metal oxide. No. 2,474,215. Kenneth K. Kearby (to Standard Oil Development Co.).

In preparing a water-soluble beryllium compound, the step of heating powdered beryl with anhydrous sodium hydroxide until a water-soluble beryllium-containing product is formed. No. 2,474,392. Perle N. Burkard and Ralph McNabney (to Wyandotte Chemicals Corp.).

In effecting dehydrogenation with a solid dehydrogenation catalyst, the improvement which comprises contacting said material to be dehydrogenated with said catalyst while the latter is disposed on the extended surface of an adsorptive lithium-aluminum compound of the formula $Li_2O \cdot 5Al_2O_3$. No. 2,474,440. Albert E. Smith and Otto A. Beeck (to Shell Development Co.).

Production of cuprous hydroxide and cuprous oxide by mixing with a caustic alkali of the class consisting of sodium and potassium hydroxides an aqueous, ammoniacal copper carbonate solution. No. 2,474,497. Percy J. Rowe (to Lake Chemical Co.).

Preparing a phosphor adapted for rapid quenching by infra red wave energy by heating a mixture of zinc sulphide, a member in activator proportions selected from the group consisting of copper and silver and mixtures thereof and a flux of a halide of an alkali metal and excluding the iodide and ammonium. No. 2,474,506. Elton J. Wood (to Radio Corp. of America).

Aqueous acid reacting non-electrolytic pickling bath for stainless steels consisting of water and active pickling agents consisting of a non-oxidizing mineral acid and ferric fluoride, said bath being substantially free of nitric acid. No. 2,474,526. John J. Healy, Jr., Maurice H. Taylor and Furio A. Abbiati (to Monsanto Chemical Co.).

Fused cast alumina refractory containing, in addition to crystalline alumina, an alkali oxide, an alkaline earth oxide selected from the group consisting of calcium oxide, barium oxide and strontium oxide and an acid oxide selected from the group consisting of silica and titania. No. 2,474,544. John Charles McMullen (to Carborundum Co.).

Producing stannic oxide by mixing solid carbon with a high iron subsilicate tin concentrate slag, heating to its melting point in an oxidizing atmosphere thus oxidizing the resultant metallic tin and reducing the stannic oxide to stannous oxide which being volatilized at bubbles through the slag and is instantaneously oxidized into stannic oxide by the atmosphere of the furnace. No. 2,474,645. Stanley M. Baxter.

Metals

Etching aluminum surfaces by making the surface an anode in an electrolytic cell, the electrolyte of which is an aqueous solution having as the essential etching component a compound selected from the group consisting of barium hydroxide and strontium hydroxide. No. 2,472,304. Ralph B. Mason (to Aluminum Co. of America).

Chemically depositing fine grain copper coating on ferrous metal as lubricant for cold working comprising immersing the metal in an aqueous bath consisting of cuprous chloride, hydrochloric acid, an agent for enhancing solubility of cuprous chloride selected from the group consisting of ammonium chloride, sodium chloride, calcium chloride and potassium chloride, polyethylene glycol and water. No. 2,472,393. Samuel C. Avallone, Arch W. Harris and Esther J. Whiting (to American Steel and Wire Co.).

Removing corrosion products from surfaces containing heavy metals which are resistant to the action of alkaline solutions by treating with an alkaline aqueous solution of a member selected from the group consisting of polyhydroxybenzenes and polyhydroxydiphenyls, each of which contains at least two adjacent hydroxy groups, and their carboxylic acids. No. 2,472,684. Carlo Rossi (to Ciba Ltd.).

Removing a porous oxide coating from the surface of a ferrous base alloy by lightly etching said alloy with a mild etching agent containing a wetting agent to effect an activation of the alloy surface and then immersing in a bath containing copper nitrate and nitric acid. No. 2,472,786. Edwin R. Bowerman, Jr. (to Sylvania Electric Products, Inc.).

Chemically coating aluminum by subjecting the surface to the action of an acid solution the essential active coating producing ingredients of which are fluoride ion, dichromate ion, phosphate ion, arsenate ion and hydrogen ion. No. 2,472,864. Frank Palin Spruance, Jr. and James H. Thirsk (to American Chemical Paint Co.).

Decarburizing and desulfurizing ferrochromium containing carbon and sulfur by mixing comminuted ferrochromium and a comminuted oxidant to combine with the carbon. No. 2,473,019. Hendrik de W. Erasmus (to Union Carbide and Carbon Corp.).

Highly compacted, uniformly porous, strongly cohesive, fine-grained, nonfriable, coalesced aggregate of ferrochromium containing chromium, carbon, silicon and iron. No. 2,473,020. Hendrik de W. Erasmus (to Union Carbide & Carbon Corp.).

Plating nickel on aluminum by dipping in ammonium bifluoride water solution, anodically oxidizing the piece in an aqueous solution of orthophosphoric acid, and electroplating nickel. No. 2,473,163. Ewald H. McCoy.

Condensing zinc as liquid from a mixture of zinc vapour with permanent gases. No. 2,473,304. S. Robson (to National Smelting Co., Ltd.).

Improving the rust resistance of a surface of a ferrous metal by a preliminary treatment of heating in the presence of oxygen until an oxide coating is formed on the surface, heating in an atmosphere of hydrogen to cause occlusion of hydrogen at the surface and to reduce any oxide coating present on the surface, and contacting said object with an aqueous solution of a non-oxidizing acid of sufficient strength and for a sufficient time to roughen the surface of said object by etching and to remove any oxide coating. No. 2,473,456. Elmer A. Thurber (to Bell Telephone Labs. Inc.).

Production of metallic zinc from roasted ores, slags and other zinciferous materials by reducing the zinciferous material at an elevated temperature to produce metallic zinc vapor in a non-oxidizing gaseous atmosphere substantially free from carbon dioxide by blowing into a molten slag bath of the zinciferous material a blast of carbonaceous fuel suspended in an oxygen-containing gas comprising not less than 40% by volume of oxygen. No. 2,473,611. Stanley Robson (to National Smelting Co. Ltd.).

Treating a surface of metal from the group consisting of iron, zinc, aluminum and of iron-base, zinc-base and aluminum-base alloys, the principal active ingredients of which consist of degras and orthophosphoric acid together with a liquid vehicle for said admixture. No. 2,473,614. Eugene Snyder (to American Chemical Paint Co.).

Reduction of ores containing nickel. No. 2,473,795. Robert C. Hills and Maurice F. Dufour (to Nicaro Nickel Co.).

Recovering cadmium from smelter fume, by digesting with dilute aqueous sulphuric acid, converting the cadmium sulphide to a soluble condition by adding cupric sulphate, removing cupric sulphide formed by the reaction of said cupric sulphate with any sulphides present, precipitating the copper and any indium and germanium with just sufficient zinc to accomplish the precipitation, removing the precipitates, adjusting the acid content, and then precipitating the cadmium by the addition of zinc. No. 2,473,962. Frank G. McCutcheon (to Eagle-Picher Co.).

Electrodepositing lead from an aqueous alkaline solution containing alkali metal plumbite and a betaine selected from the group consisting of trimethyl-c-cetyl alpha-betaine, trimethyl-c-decyl alpha-betaine, and dimethyl-N-lauryl alpha-betaine. No. 2,474,092. Andrew W. Liger (to Battelle Development Corp.).

Anodic coating of magnesium by immersing the article in a solution consisting of water, an alkali metal hydroxide, and a water-soluble aliphatic hydroxyl compound selected from the group consisting of methanol, ethanol, ethylene glycol, propylene glycol, glycerol, mannitol, 2-ethoxy-ethanol, and diethylene glycol. No. 2,474,181. Herbert K. De Long (to Dow Chemical Co.).

Organic

2-p-chloroanilino-4-chloro-quinoline. No. 2,472,066. Francis Henry Swin-

den Curd, Clifford Gordon Raison and Francis Leslie Rose (to Imperial Chemical Industries Ltd.).

Carburetor process for making n-vinyl compounds. No. 2,472,085. Hans Beller and Robert E. Christ and Fritz Wuerth (to General Aniline & Film Corp.).

Thiophanthraquinone-2-carboxylic acid. No. 2,472,133. Viktor Weinmayr (to E. I. du Pont de Nemours & Co.).

Dibenzylidene derivative of 2,2,6,6,-tetramethylolcyclohexanol. No. 2,472,147. Otis C. Dermer (to Cities Service Oil Co.).

Preparation of d-glucosaccharic acid by oxidizing glucose in the presence of a platinum catalyst. No. 2,472,168. Charles L. Mehltretter, Carl E. Rist and Benjamin H. Alexander (to U.S.A. by the Secretary of Agriculture).

Preparation of gluten sulfate comprising reacting a gluten with concentrated sulfuric acid followed by reacting the reaction product with an inorganic hydroxide. No. 2,472,267. Henry C. Reitz (to U.S.A. by the Secretary of Agriculture).

2,2-bis-(4-methylthiophenyl)-1,1,1-trichloroethane. No. 2,472,269. David A. Shirley (to E. I. du Pont de Nemours & Co.).

Contacting a glucose derivative and an aromatic hydrocarbon in the presence of anhydrous aluminum chloride, said glucose derivative being characterized in that there is attached to the carbon atom of the aldehydic function a substituent selected from the group consisting of Cl, Br and acyloxy and in that the glycose derivative has protected hydroxyl groups. No. 2,472,276. William Andrew Bonner and Charles D. Hurd (to Corn Products Refg. Co.).

Effecting the reaction between a polyacylglycosyl ester and a Grignard reagent. No. 2,472,277. William Andrew Bonner and Charles D. Hurd (to Corn Products Refg. Co.).

Benzylideneamino compounds of pyridine. No. 2,472,292. Harris L. Friedman and Leo D. Braitberg (to Pyridium Corp.).

Producing α-ethynyl (β-ionol) comprising in an inert solvent reacting lithium acetylide with β-ionone and hydrolyzing the resultant reaction product. No. 2,472,310. William Oroshnik (to Ortho Pharmaceutical Corp.).

Preparing an organic N-halogen compound by reacting an organic N-hydrogen compound, which is decomposed by a hypohalite salt acting alone, with a hypohalogen acid in an aqueous solution. No. 2,472,361. William C. Arsem.

In producing ethylenic glycol, the step consisting in hydrating ethylene oxide in the presence of a trihalogenacetic acid. No. 2,472,417. Max Gonze (to Solvay & Cie).

Forming cuprous naphthenate which comprises bringing napthenic acid into contact with a finely-divided copper compound of the group consisting of cuprous oxide, cupric oxide, cuprous hydroxide, cupric hydroxide, cupric carbonate and cupric acetate. No. 2,472,424. Charles O. Hoover (to Air Reduction Co., Inc.).

Preparing a vinyl ester by reacting a vinyl haloformate with a salt of a polycarboxylic acid, to evolve carbon dioxide and to produce a vinyl ester of the polycarboxylic acid, and recovering said ester. No. 2,472,434. Alphonse Pechukas (to Pittsburgh Plate Glass Co.).

Dehydroabietic acid derivatives. No. 2,472,437. Yolanda T. Pratt (to Hercules Powder Co.).

Imidazolido thiophanes. No. 2,472,458. Bernard R. Baker and Merle V. Querry (to American Cyanamid Co.).

Reacting 2,4,5-triamino-6-hydroxy-pyrimidine and a member of the group consisting of N(acyl)-N(beta-dihalo-gamma-halopropyl) para aminobenzoic acids and amino acid amides thereof. No. 2,472,462. James H. Boothe (to American Cyanamid Co.).

Making mercaptans having the general formula, RSH, wherein R represents a hydrocarbon group containing an alkyl radical which comprises reacting hydrogen sulfide at room temperature in the presence of a Friedel-Crafts type catalyst with an organic halide. No. 2,472,470. Lawrence T. Eby (to Standard Oil Development Co.).

Making thioether compounds having the general formula R—S—R′, wherein R and R′ represent hydrocarbon groups containing an alkyl radical, which comprises reacting a mercaptan of the formula RSH with an organic halide. No. 2,472,471. Lawrence T. Eby (to Standard Oil Development Co.).

Preparing pterins by reacting 2,4,5-triamino-6-hydroxypyrimidine, an amide of para-aminobenzoic acid and a compound having the formula: Hal CHX—CO—CHX—CO—CH₃ in which X is a member of the group consisting of hydrogen and halogen. No. 2,472,481. Martin E. Hultquist and Doris R. Seeger (to American Cyanamid Co.).

Reacting together 2,4,5-triamino-6-hydroxypyrimidine, a 1,1-dihalo-2,3-epoxypropane and an amino acid amide of para-amino-benzoic acid whereby pterins are formed. No. 2,472,482. Martin E. Hultquist and Paul Franklin Dreisbach (to American Cyanamid Co.).

Producing ketones by passing a secondary aliphatic alcohol over a metal oxide dehydrogenation catalyst selected from the group consisting of zinc oxide, cerium oxide and magnesium oxide and bismuth oxide. No. 2,472,493. Helmuth G. Schneider and Vincent F. Mistretta (to Standard Oil Development Co.).

1-carbethoxy-4-methylpiperazine. No. 2,472,496. Hugh W. Stewart (to American Cyanamid Co.).

Barium salt of a tertiary amyl phenol sulphide. No. 2,472,504. Carl Winning (to Standard Oil Development Co.).

Production of dinitro paraffins by introducing an aliphatic mono-olefine having 3 to 6 carbon atoms into a solution of nitrogen tetroxide in an organic, saturated, non-benzenoid solvent compound containing carbon, hydrogen and oxygen only, all oxygen in said solvent being present in an ether group, and all ring systems present in said solvent compound having at least 5 members. No. 2, 472,550. A. E. W. Smith, C. W. Scaife and H. Baldock (to Imperial Chemical Industries Ltd.).

N-(4,5-dihydroxy-n-amyl) and n-(4,5-diacyloxy-n-amyl) aromatic amines. No. 2,472,575. Joseph B. Dickey (to Eastman Kodak Co.).

Producing a 3-alkoxy-5-pyrazolone by stirring an ether solution of a mono-substituted hydrazine selected from the group consisting of alkyl, mono-nuclear aryl and benzothiazolyl hydrazines and an ethyl β-alkoxy-β-iminopropionate. No. 2,472,581. Walter A. Gregory (to Eastman Kodak Co.).

Producing a heterocyclic nitrogen base sulfonate by intimately commingling an oil solution of a sulfonic acid with a heterocyclic nitrogen base. No. 2,472,583. Felix C. Gzemski (to Atlantic Refg. Co.).

NO_2-oxidized starch which is insoluble in water, free of non-uronic carboxyl groups and having a CO_2 equivalence of at least 12%. No. 2,472,590. William O. Kenyon and Cornelius C. Unruh (to Eastman Kodak Co.).

Production of ethyl alcohol from ethylene by reacting ethylene, sulphur dioxide, and water. No. 2,472,618. Alexander S. Ramage (to Albert A. F. Maxwell).

Preparing an O-acetylated compound and a C-acetylated compound comprising reacting ketene with a ketoester. No. 2,472,628. John A. Spence and Edward F. Degering (to Purdue Research Foundation).

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Solid, elastic, curable, polymerized, methyl-substituted polysiloxane. No. 2,472,629. Murray M. Sprung (to General Electric Co.).

Process for acylating an amine selected from the group consisting of primary and secondary amines comprising condensing the amine with an unsaturated ester. No. 2,472,633. William P. Utermohlen, Jr. (to Eastman Kodak Co.).

Production of organo-silicon compositions which comprises dehydrating a reaction mixture of an alkali metal oxide, water, and an organosilicon compound. No. 2,472,799. J. F. Hyde (to Corning Glass Works).

Esters of alpha-fluoromethyl acrylic acids. No. 2,472,812. Joseph B. Dickey (to Eastman Kodak Co.).

Stabilized aromatic carbocyclic compound containing a nuclear substituent of the class consisting of hydroxyl and amino groups and acid addition salt groups corresponding to said amino groups, having incorporated an iminoaminomethanesulfinic acid. No. 2,472,868. Edward W. Tillitson (to Parke, Davis & Co.).

Xylyl trichlorothiolacetate. No. 2,472,897. Alban Thomas Hallowell (to E. I. du Pont de Nemours & Co.).

Diester-amide of diethanolamine and 2-ethylhexanoic acid, such diester-amide being a high-boiling liquid effective as a plasticizer for vinyl chloride resins. No. 2,472,901. Franklin Johnston and William H. Hensley (to Carbide & Carbon Chemicals Corp.).

Tetrahydro-1-hydroxy-2-and-3-naphthamidobenzaldehydes and their acetals with lower alkanols and 1,2-and 1,3-alkanediols. No. 2,472,910. Elmore Louis Martin (to E. I. du Pont de Nemours & Co.).

Drying alcohol containing water by contacting with an argillaceous absorbent. No. 2,472,912. William S. W. McCarter (to Attapulgus Clay Co.).

Making trichloroacetyl chloride from tetrachloroethylene by contacting gaseous oxygen with liquid tetrachloroethylene in the presence of chlorine and in the presence of an organic peroxide. No. 2,472,946. Edwin J. Hart and Max S. Matheson (to U. S. Rubber Co.).

Purifying crude chloral containing under-chlorinated materials by adding concentrated sulfuric acid to said crude chloral, whereby the said underchlorinated constituents are polymerized. No. 2,473,003. Harold C. Beachell and Michael Sveda (to E. I. du Pont de Nemours & Co.).

Preparing halohydrin acetaldehyde acetals by reacting in the presence of a strongly acidic catalyst and a mercury catalyst a vinyl ester of a monocarboxylic acid, destroying the acid catalyst in the reaction mixture and separating therefrom an acetal. No. 2,473,014. Willard J. Croxall, Bryn Athyn, and Harry T. Neher (to Rohm & Haas Co.).

3,5-dihydroxy-4-dihydro thiadiazine-1-dioxide. No. 2,473,042. Henry A. Walter (to Monsanto Chemical Co.).

Production of 2-amino pyrimidines and 2-amino **glyoxalines.** No. 2,473,111. Wallace Frank Short and Peter Oxley (to Boots Pure Drug Co. Ltd.).

Preparation of sulfonic acid salts of diguanides. No. 2,473,112. Wallace Frank Short, Gordon Ivan Hobday and Peter Oxley (to Boots Pure Drug Co. Ltd.).

3-alkylsulfonamido-pyridinium salts. No. 2,473,121. Mitchell F. Zienty (to Upjohn Co.).

Propane chlorination. No. 2,473,161. Earl T. McBee and Lawrence W. Devaney (to Purdue Research Foundation).

Liquid phase chlorination of propane. No. 2,473,162. Earl T. McBee and Lawrence W. Devaney (to Purdue Research Foundation).

In distillation of a diolefin, the improvements which comprise introducing into distilled vapors of a diolefin a relatively non-volatile polymerization inhibitor as a fine mist. No. 2,473,203. Ralph F. Howe (to Standard Oil Development Co.).

Removing saturated hydrocarbons from an acid extract by contacting a hydrocarbon stream containing mono-olefins and saturated hydrocarbons with a strong mineral acid, diluting the acid extract with an aqueous diluent, cooling the extract, thereafter reducing the pressure on the cooled extract to atmospheric pressure to release saturated hydrocarbons therefrom and separating the released saturated hydrocarbons from the acid extract. No. 2,473,224. Helmuth G. Schneider and Vincent F. Mistretta (to Standard Oil Development Co.).

Preparing tetramethyl silicate by heating a mixture comprising silicon and methyl alcohol in the presence of a compound selected from the class consisting of copper, oxides of copper, hydroxides of copper, copper halides, copper salts of aliphatic acids, copper carbonates, copper hydroxide, copper cyanide, and mixtures thereof. No. 2,473,260. Eugene G. Rochow (to General Electric Co.).

Mono-olefinic mononitrohalohydrocarbon having from 4 to 16 carbon atoms. No. 2,473,341. Eduard Cornelis Kooijman and Johan Overhoff (to Shell Development Co.).

Preparing hydrocarbometallic halides by reacting under an atmosphere free from oxygen and moisture a bihalide of a metal of group II-B in the long periods of the periodic table with an organoaluminum compound in an anhydrous inert organic liquid solvent, said organoaluminum compound containing at least one monovalent hydrocarbon radical free from non-benzenoid unsaturation and wherein the valences of aluminum are satisfied solely by members selected from the class consisting of halogen atoms and hydrocarbon radicals, the halogens in both of said reactants having an atomic number between 16 and 54. No. 2,473,434. Richard V. Lindsey, Jr. (to E. I. du Pont de Nemours & Co.).

Manufacture of cyclohexene by pyrolyzing a mixture consisting of 2-pentene and 1-pentene in the presence of steam to produce ethylene and 1,3-butadiene, separating and recovering the ethylene and 1,3,-butadiene and condensing the 1,3-butadiene and ethylene to produce cyclohexene. No. 2,473,472. Everett Gorin and Alex G. Oblad (to Socony-Vacuum Oil Co., Inc.)

Preparation of aminophthalidylalkanes. No. 2,473,484. Glenn E. Ullyot (to Smith, Kline & French Labs.).

Producing 1-cyanobutadiene-1,3 by acylating a difficultly separable mixture comprising 1-cyanobutadiene-1,3 and 1-cyano-3-butene-2-ol and pyrolyzing the acylated mixture. No. 2,473,486. Paul H. Wise (to Wingfoot Corp.).

Preparation of an N-dimethylethanolamine by subjecting formaldehyde cyanhydrin to hydrogenation in the presence of formaldehyde and methanol and in the presence of a hydrogenation catalyst. No. 23,124. William F. Gresham (to E. I. du Pont de Nemours & Co.).

In producing vinyl chloride the combination of steps which comprises subjecting ethylene dichloride to pyrolysis to form vinyl chloride and hydrogen chloride, passing the products of pyrolysis over an activated adsorbent, adding acetylene to the adsorbent treated products of pyrolysis, and catalytically reacting the acetylene with the hydrogen chloride. No. 23,128. Joseph F. Weiler (to Mathieson Chemical Corp.).

2,5-dimethyl-2-hydroxymethyl-2,3-dihydropyran. No. 2,473,497. Newman M. Bortnick (to Rohm & Haas Co.).

Carbonic acid amides of certain substituted glyoxalidines. No. 2,473,577. Melvin De Groote and Bernhard Keiser (to Petrolite Corp. Ltd.).

Trialkyl phenyl phosphates prepared by reacting with phosphorus oxychloride alkyl phenols obtained from petroleum. No. 2,473,612. Royal L. Shuman (to Celanese Corp. of America).

Manufacture of organic derivatives of quinquevalent antimony consisting in reacting a compound selected from the group of compounds consisting of pentahalides of antimony and alcoholates of pentahalides of antimony and an aqueous solution of a compound selected from the group consisting of aliphatic hydroxycarboxylic acids, hydro-aromatic hydroxycarboxylic acids and alkali and alkaline earth metal salts of said acids. No. 2,473,735. William Solomon (to Burroughs Wellcome & Co.).

Preparation of heterocyclic compounds. No. 2,473,796. Martin E. Hultquist (to American Cyanamid Co.).

Triazolylene triazines. No. 2,473,797. Donald W. Kaiser (to American Cyanamid Co.).

Subjecting 2,4-diamino-5-nitroso-6-hydroxypyrimidine to the action of zinc dust and ammonium hydroxide whereby the nitroso radical is reduced to an amino radical and acidifying the reduction liquor to precipitate an acid salt of 2,4,5-triamino-6-hydroxypyrimidine. No. 2,473,802. Erwin Kuh and Hugh S. Barnaby (to American Cyanamid Co.).

9-desoxy iso-xanthopterin carboxylic acid and its alkali metal salts. No. 2,473,811. John H. Mowat and James H. Boothe (to American Cyanamid Co.).

In producing an anthraquinone C-arylthiazole by heating an aminoanthraquinone, sulfur, an omega-polyhalogenated arylmethane and an inert orgnic solvent, the improvement of including in the reaction mixture a member of the group consisting of carbocyclic hydroxy compounds and omega-halogenated aryl methane condensation products. No. 2,473,872. Maurice H. Fleysher (to Alied Chemical & Dye Corp.).

Recovering fluorocarbon from a liquid mixture of at least one hydrocarbon with partially fluorinated and completely fluorinated products thereof which comprises extracting hydrocarbon by contacting it with ethyl alcohol having dissolved therein a small proportion of water and subsequently submitting the mixture to fractional distillation to isolate at least one fluorocarbon fraction. No. 2,473,911. Norman Francis Sarsfield (to Imperial Chmeical Industries Ltd.).

Improving the color of glyceridic esters of long chain fatty acids containing minor proportions of free fatty acids which comprises dispersing a dry mixture of chlorine dioxide and an inert gas through the fatty material. No. 2,473,930. Eric R. Woodward (to Mathieson Chemical Corp.).

2-and 4-sulfanilamido quinazoline. No. 2,473,931. Frank J. Wolf (to Merck & Co., Inc.).

Stabilizing tetra-alkyl lead by placing upon the surface a thin inert protective surface film consisting of mono-benzyl-para-aminophenol dissolved in tri-ethanolamine. No. 2,473,972. George F. Ruddies.

N^1-p-bromophenyl-N^5-isopropyl-biguanide. No. 2,473,989. Francis Henry Swinden Curd and Francis Leslie Rose (to Imperial Chemical Industries Ltd.).

Chlorinating the benzene nucleus of an aromatic compound by causing said aromatic compound to react in the liquid phase with chlorine in the presence of a magnesium-iron-alumino-silicate catalyst. No. 2,473,990. John L. Darragh (to California Research Corp.).

In synthesis of metal carbonyls the step which consists in forming a metal carbonyl of the class consisting of nickel carbonyl and cobalt carbonyl by reacting a metal salt of an organic carboxylic acid, said metal being a member of the class consisting of nickel and cobalt, with carbon monoxide and hydrogen in the presence of an organic solvent. No. 2,473,993. William F. Gresham and John V. E. Hardy (to E. I. du Pont de Nemours & Co.).

Synthesis of diethyl ketone by heating a mixture of ethylene, carbon monoxide, and hydrogen. No. 2,473,995. William F. Gresham, Richard E. Brooks and William E. Grigsby (to E. I. du Pont de Nemours & Co.).

Production of 1,4-dihydronaphthalene comprising reacting naphthalene with an alkali metal and a tertiary aliphatic alcohol. No. 2,473,997. Virgil L. Hansley (to E. I. du Pont de Nemours & Co.).

Production of partial oxidation products by oxidizing a vaporized hydrocarbon of the benzene series selected from the group consisting of benzene, toluene and xylene with an oxygen-containing gas, in the presence of a catalyst comprising vanadium metal with an indigenous coating of a vanadium oxide. No. 2,474,001. Irving E. Levine (to Calif. Research Corp.).

In producing phthalic anhydride and an improved hydrocarbon stock having enhanced properties as a blending agent in aviation gasolines, the steps which comprise treating an aromatized mixture of petroleum hydrocarbons to separate an alkyl benzene fraction containing about 70% by volume of phthalic anhydride convertible alkyl benzenes, oxidizing said last alkyl benzene fraction to phthalic anhydride and oxidizing inconvertible hydrocarbons to the point of ring rupture by passing said last fraction in vapor phase over a vanadium oxide catalyst at a catalyst temperature of from 800° F. to 1175° F. No. 2,474,002. Irving E. Levine and William H. Claussen (to California Research Corp.).

Preparation of ethyleneurea from ethylene glycol and urea. No. 2,474,004. Donald J. Loder (to E. I du Pont de Nemours & Co.).

Reacting acetyl saligenin with acetyl salicyloyl chloride in the presence of pyridine, and separating 2-acetoxybenzyl acetylsalicylate. No. 2,474,005. Gustav J. Martin and Harold Urist (to National Drug Co.).

Plasticizer comprising mixed ester of an aliphatic dihydric alcohol with a fatty acid and a carboxylic aliphatic nitrile. No. 2,474,010. Latimer D. Myers and J. D. Fitzpatrick (to Emery Industries, Inc.).

Producing lactic acid from waste sulphite liquor. No. 2,474,046. Karl W. Fries (to Rhinelander Paper Co.).

Making carbon bisulfide and hydrogen sulfide by intermittently introducing sulphur, admitting a hydrocarbon gas, then conducting the mixture of sulphur vapors and hydrocarbon gas through a heated catalyst. No. 2,474,067. Louis Preisman (to Barium Reduction Corp.).

Secondary amines of 3,3 bis (p-amino-phenyl) phthalide. No. 2,474,084. Clyde S. Adams (to National Cash Register Co.).

Manufacturing ammonium salts of maleic acid by agitating solid maleic acid, and passing ammonia gas into contact with the maleic acid. No. 2,474,089. Boyce G. Carson (to E. I. du Pont de Nemours & Co.).

Separation of acetone and butyl alcohol from fermented mash by activated charcoal. No. 2,474,170. Max Sulzbacher (to Butacet Ltd.).

Rocket propulsion by reacting alkyl-substituted mononuclear aromatic amines and nitric acid. No. 2,474,183. Victor L. King (to American Cyanamid Co.).

4-amino-1,8-naphthalic acid imides by reacting 4-amino-1,8-naphthalic anhydride with an undiluted primary amine. No. 2,474,185. Hans Z. Lecher, Mario Scalera, Asa Willard Joyce and Warren S. Forster (to American Cyanamid Co.).

4-N-2'-pyridyl formoguanamine. No. 2,474,194. Jack Theo Thurston (to American Cyanamid Co.).

Making a quaternary ammonium compound by heating, in the presence of an acid condensing agent, a mixture of a polyamine $H(NHR)_xNH_2$, where R in an alkylene radical and x is a number from 1 to 6, a fatty acid having more than 6 carbon atoms and an alcoholic compound condensable with said polyamine. No. 2,474,202. John B. Rust (to Montclair Research Corp.).

Production of vinyl chloride by subjecting ethylene dichloride to pyrolyzing conditions to vinyl chloride and hydrogen chloride, combining at least a part of said pyrolysis products with acetylene and form hydrochlorinating acetylene with the formation of vinyl chloride. No.

2,474,206. Willem Leendert Johannes de Nie (to Shell Development Co.).

Producing a pinacol by subjecting a solution of a mononuclear aryl lower alkyl ketone to the action of an alkali metal-lead alloy and a hydrogen donor. No. 2,474,216. P. J. Breivogel (to White Labs., Inc.).

Preparation of tertiary alkyl sulfenamides. No. 2,474,237. Lawrence T. Eby (to Standard Oil Development Co.).

Oxidizing cyclohexane by forming a bed of vanadium pentoxide, heating, passing a heated vaporous stream of cyclohexane over said bed to activate said bed, forming an admixture of cyclohexane with an oxygen-containing gas, reducing the temperature of said activated bed and subsequently passing said admixture at a temperature of approximately 600° F. over said activated bed to obtain maleic acid. No. 2,474,334. Albert J. Shmidl (to Standard Oil Development Co.).

Preparing alkyl-substituted silicon compounds by reacting molten metallic sodium with a tetraalkylorthosilicate and a dialkyl sulfate. No. 2,474,444. Ambrose George Taylor (to Dow Corning Corp.).

Improved process for the preparation of ethyl alcohol from a solution of diethyl sulfate in strong sulfuric acid, comprising diluting with water to a 40-55 weight percent sulfuric acid concentration and hydrolyzing the major portion of said diethyl sulfate in a first hydrolysis maintained at 80-90° C., withdrawing a stream of the resulting partly hydrolyzed solution and passing it through a second hydrolysis zone maintained between 80 and 95° C., providing sufficient residence time in said second zone for substantially complete hydrolysis, then stripping alcohol from the stream leaving said second zone by contact with steam. No. 2,474,568. Lewis A. Bannon and Charles E. Morrell (to Standard Oil Development Co.).

Improved continuous process for the hydrolysis of a solution of diethyl sulfate in strong sulfuric acid. No. 2,474,569. Lewis A. Bannon (to Standard Oil Development Co.).

Methyldichloromethyldichlorosilane. No. 2,474,578. William F. Gilliam (to General Electric Co.).

Manufacturing ethyl alcohol by contacting a hydrocarbon mixture containing ethylene with 95-100% H_2SO_4 at 60-100° C. and a 300-500 pounds per square inch gauge, then contacting said extract with a hydrocarbon mixture containing ethylene for 1-3 hours at 80-110° C. and 300-500 pounds per square inch gauge and hydrolyzing the last extract with water to produce ethyl alcohol. No. 2,474,588. Charles E. Morrell and Richard F. Robey (to Standard Oil Development Co.).

Substituted 3-carbamyl-2-piperidones. No. 2,474,589. Glen H. Morey (to Commercial Solvents Corp.).

In preparing 1,2,3,4,5,6-hexachlorocyclohexane, the steps which comprise preparing a two liquid layer system consisting of an aqueous lower layer and an upper benzene layer, said lower layer containing a mixture of a soluble base and an inert water soluble salt amount sufficient to render the specific gravity of the said aqueous lower layer at least as high as that of the chlorinated benzene produced, and passing a stream of chlorine into said lower layer to react at the interface with said benzene layer. No. 2,474,590. Glen H. Morey (to Commercial Solvents Corp.).

Basic-alkyl esters and their salts. No. 2,474,651. Frederick F. Blicke (to Regents of the University of Michigan).

Continuous method of extracting the pentoses and hexoses from comminuted wood comprising impregnating wood by treating it with heated liquid hydrochloric acid. No. 2,474,669. Andre Hereng.

Reacting ethyl β-acetoxy acrylate, chlorine and ethyl alcohol to produce ethyl α-chloro-β, β-diethoxy propionate. No. 2,474,715. Robert D. Babson (to Merck & Co., Inc.).

Separating the stereoisomers of α-hydroxy-β, β-dimethylgamma-butyrolactone as alkali metal salts by treating with brucine dissolved in an inorganic acid and removing the brucine-dextrorotatory-α-gamma-dihydroxy-β, β-dimethyl butyric acid-brucine-acid salt formed. No. 2,474,719. Ralph H. Beutel and Max Tishler (to Merck & Co., Inc.).

Preparing partial esters of glycerine and fatty acids having a larger number of free hydroxy groups than the starting glycerides which comprises feeding the fatty glycerides having at least two esterified hydroxy groups and glycerine containing a minor proportion of water into a vertical reaction zone, in countercurrent flow and withdrawing the reaction product and excess glycerine. No. 2,474,740. Martin Hill Ittner (to Colgate-Palmolive-Peet Co.).

Recovery of pyrene in the form of tri-and tetra-chloropyrenes from fractions of coal tar, hydrogenated coal tar and hydrogenated coal by passing chlorine into an organic solvent solution of the pyrene containing fraction. No. 2,474,777. Peter George Carter (to Imperial Chemical Industries Ltd.).

Azo compounds from 1-di-n-butyl-amino-2-nitro-butane. No. 2,474,779. Edward F. Degering and Gerhard van Biema (to Purdue Research Foundation).

Azo compounds from 1-N-morpholino-2-nitro propane. No. 2,474,780. Edward F. Degering and Gerhard van Bieme (to Purdue Research Foundation).

Producing pyrazine by catalytic dehydrogenation of piperazine over a catalyst selected from the group consisting of the oxides of the members of the left sub-groups of the fifth, sixth and seventh groups of the periodic arrangement of elements. No. 2,474,781. James Kenneth Dixon (to American Cyanamid Co.).

Catalytic dehydrogenation of piperazine to pyrazine over a palladium dehydrogenation catalyst. No. 2,474,782. James Kenneth Dixon (to American Cyanamid Co.).

Nitroalkyl substituted heterocyclic compounds. No. 2,474,791. Murray Senkus (to Commercial Solvents Corp.).

Polyamino alcohols having the following structural formula: $CH_2\text{-}NR^1\text{-}CH_2\text{-}C(NH_2)R^2\text{-}CH_2OH$ wherein R^1 is a member of the group consisting of alkyl and 3,5-dioxacyclohexyl, and R^2 is a member of the group consisting of hydrogen and alkyl. No. 2,474,792. Murray Senkus (to Commercial Solvents Corp.).

Amino alcohol esters of carboxy acids of the formula, RR_1COOH, in which R and R_1 are alicyclic. No. 2,474,796. Marcus George Van Campen, Jr. and Charles Harman Tilford (to Wm. S. Merrell Co.).

Petroleum

Diesel engine fuel consisting of a Diesel engine fuel from which ignition delaying compounds have been removed and a saturated cyclic hydrocarbon hydroperoxide prepared by oxidizing a saturated cyclic hydrocarbon containing from 4 to 8 carbon atoms in the ring. No. 2,472,152. Adalbert Farkas and Arthur F. Stribley, Jr. (to Union Oil Co. of Calif.).

Refining a viscous petroleum oil with fuming sulfuric acid, treating the acid-treated oil with an alkali metal hydroxide to neutralize the acid-treated oil, air-blowing the neutralized oil in the presence of the excess nuetralizing agent, in the absence of a diatomaceous filter-aid, to reduce the water content and subsequently washing the dehydrated oil with alcohol, and treating to remove all of alcohol. No. 2,472,217. Eugene E. Langan. Norman E. Lemmon and Frederick W. Schuessler (to Standard Oil Co.).

In converting hydrocarbon gases into hydrocarbons of higher molecular weight, the steps which comprise converting a hydrocarbon gas into hydrogen and carbon monoxide, contacting said mixture with a synthesis catalyst to produce higher-molecular-weight hydrocarbons and oxygenated compounds, partially condensing the vaporous reaction product, withdrawing oxygenated hydrocarbon compounds from said reaction product, and recycling at least a portion of said oxygenated hydrocarbon for reconversion to hydrogen and carbon monoxide. No. 2,472,219. Leland R. Lyons (to Standard Oil Co.).

Production of cuprous naphthenate in the treatment of petroleum oil. No. 2,472,253. Charles O. Hoover (to Air Reduction Co., Inc.).

Mineral lubricating oil composition comprising a lubricating oil fraction and a compound of the general formula RSR'SR where R is one of the groups taken from the class consisting of an aryl, alkyl aryl and substituted aryl, alkyl aryl groups, and where S is sulfur and R' is a low molecular weight alkyl group taken from the group consisting of methyl and ethyl groups to inhibit oxidation of said oil. No. 2,472,318. Philip Subkow.

Synthesizing organic compounds through the catalytic hydrogenation of carbon monoxide. No. 2,472,377. Percival C. Keith (to Hydrocarbon Research, Inc.).

Producing normally liquid products by a carbon monoxide-hydrogen synthesis reaction with fluidized catalyst regeneration. No. 2,472,427. Everett A. Johnson (to Standard Oil Co.).

Distilling cracked gasoline which consists of mixing gasoline containing gum forming unsaturated hydrocarbons with petroleum phenols and an acid catalyst selected from the class consisting of sulfuric acid and aromatic sulfonic acid. No. 2,472,463. Richard C. Brandon and Minor C. K. Jones (to Standard Oil Development Co.).

Butadiene extraction with a cuprous salt solution. No. 2,472,487. John B. Lovell (to Standard Oil Development Co.).

Producing a catalyst useful for the catalytic cracking of hydrocarbon oils which comprises digesting a bentonite clay with sulfuric acid to produce an activated clay. No. 2,472,489. Jerry A. Pierce (to Standard Oil Development Co.).

Preparing a porous siliceous composition of matter suitable for use as a catalyst and promoting catalyst carrier, which comprises forming a glass melt consisting of an alkali metal oxide, boric oxide, silica, and metal oxide selected from the group consisting of the oxides of iron, copper, and nickel. No. 2,472,490. Charles J. Plank (to Socony-Vacuum Oil Co., Inc.

Solvent extraction of oil with a water miscible organic solvent liquid. No. 2,472,499. Charles M. Stone (to Texas Co.).

Process of regenerating synthesis catalyst with oxygen and return of oxidized catalyst to the synthesis reactor. No. 2,472,501. Sumner B. Sweetser (to Standard Oil Development Co.).

Mineral lubricating oil having incorporated an oil-soluble polyvalent metal salt of an acidic aromatic compound selected from the group consisting of phenols and aromatic carboxylic acids and a saponifiable oxidation product of a polymeric olefin of lubricating oil viscosity, said oxidation product being obtained as follows: polymerizing an olefinic hydrocarbon material to produce a synthetic polymeric olefin hydrocarbon oil of lubricating oil viscosity and oxidizing said synthetic hydrocarbon oil with an oxygen-containing gas to partially oxidize the synthetic hydrocarbon oil. No. 2,472,503. Johan Leonard van der Minne (to Shell Development Co.).

Hydrocarbon conversion with fluidized catalyst. No. 2,472,537. Thomas Bisbee Kimball (to Sinclair Refining Co.).

Breaking petroleum emulsions of the water-in-oil type, characterized by subjecting the emulsion to the action of a demulsifier including a cation-active polychloride, said cation-active polychloride being the reaction product of diglycol chloroformate and a hydroxylated monoacylated amine. No. 2,472,573. Melvin De Groote and Bernhard Keiser (to Petrolite Corp. Ltd.).

Breaking petroleum emulsions of the water-in-oil type, characterized by subjecting the emulsion to the action of a demulsifier including an oxyalkylated, drastically oxidized oiticica oil-caster oil condensate. No. 2,472,574. Melvin De Groote and Bernhard Keiser (to Petrolite Corp).

Recovering the products of hydrogenation of oxides of carbon by cooling to effect condensation of normally liquid components to form an oil product liquid phase and gases containing oxygenated organic compounds and hydrocarbons, separating the oil product liquid phase and gases, subjecting said gases to extraction with a solvent for oxygenated organic compounds to absorb substantially all oxygenated organic compounds, subjecting said extract to fractionation to separate the oxygenated organic compounds into a first fraction comprising oxygenated organic compounds boiling below the boiling point of said solvent and a second fraction comprising said solvent and oxygenated organic compounds boiling above the boiling point of said solvent separating said solvent from said last mentioned oxygenated organic compounds, and passing the solvent thus separated to said extraction step. No. 2,472,837. Charles C. King (to M. W. Kellogg Co.).

Maintenance of catalyst activity in hydrocarbon conversion processes. No. 2,472,844. John C. Munday and Edward W. S. Nicholson (to Standard Oil Development Co.).

Treating a hydrocarbon material containing as an impurity a relatively small percentage of organically combined fluorine by contacting at defluorinating conditions of temperature and pressure with a substantially anhydrous liquid complex of boron trifluoride and an oxygen-containing organic compound. No. 2,472,908. Carl B. Linn (to Universal Oil Products Co.).

Selectively polymerizing diolefins in an unsaturated and aromatic gasoline distillate from a high-temperature cracking process by catalytically active clay. No. 2,473,206. Minor C. K. Jones and Richard C. Brandon (to Standard Oil Development Co.).

Preparing a composition for depressing and stabilizing the pour point of a mineral oil from a solid subdivided adsorbent containing color-imparting carbonaceous bodies adsorbed from a fraction obtained by fractional distillation without substantial cracking by extracting from said adsorbent color bodies adsorbed from said oil by purging with steam but not removable by non-aromatic naphtha and cracking the extract thus obtained to obtain residuum effective as a pour point depressant and pour point stabilizer. No. 2,473,370. Russell J. Hawes, William F. Behrman and Charles A. Campbell (to Tide Water Associated Oil Co.).

Motor fuel composed of a mixture consisting of ethanol, secondary butanol, hydrocarbons selected from the group of paraffins and olefines with 3 to 5 carbon atoms in the molecule, the latter having not more than one double linkage in the molecule and water. No. 2,473,439. Herbert Lightfoot Maxfield (to Distillers Co. Ltd.).

Preventing discoloration of a refined petroleum distillate during geographical transportation thru a ferrous metal pipe line by a small amount of an aqueous corrosion inhibitor comprised of sodium hydroxide and ammonia. No. 2,473,455. Leonard V. Sorg (to Standard Oil Co.).

Preparing a surface-tension modifying agent by condensing citric acid with an open-chain aliphatic monohydric alcohol containing from 8 to 30 carbon atoms. No. 2,473,460. James H. Werntz (to E. I. du Pont de Nemours & Co.).

Compounded lubricating oil, comprising a petroleum oil of lubricating viscosity and dicetyl monotelluride. No. 2,473,511. George H. Denison, Jr. and Paul C. Condit (to California Research Corp.).

Treating crude oil to enable the formation of a sludge which is pumpable by mixing the crude oil with ammonium oleate and allowing the mixture to settle. No. 2,473,522. Robert L. Harris (to Standard Oil Co.).

In the extractive distillation of aliphatic C_5 hydrocarbon mixtures containing unsaturated C_5 hydrocarbons in admixture with more saturated C_5 hydrocarbons using furfural containing dissolved water as the selective solvent, the improvement which comprises inhibiting polymerization of the furfural by incorporating mercaptobenzothiazole. No. 2,473,750. John C. Hillyer and Daniel A. Nicewander (to Phillips Petroleum Co.).

Increasing the aromaticity of a petroleum naphtha by contacting with a catalyst consisting essentially of a group VI heavy metal oxide carried on a zinc spinel base. No. 2,474,213. James F. Black (to Standard Oil Development Co.).

Composition consisting of a waxy mineral oil base stock, containing a resinous product having the general formula $[RxAr(OH).C_2H_4—]n$ in which Rx represents 1-4 alkyl groups having a total of 3 to 30 carbon atoms, i.e., x being 1-4, Ar represents an aromatic nucleus and n indicates the degree of polymerization. No. 2,474,342. David W. Young and Paul W. Brakeley, Jr. (to Standard Oil Development Co.).

Recovery of hydrocarbons from oil shale. No. 2,474,345 Alfred Clark and Howard R. Sailors (to Phillips Petroleum Co.).

Treating used hydrocarbon lubricants and greases to recover the hydrocarbon compounds by agitating with an aqueous solution containing ethylene diamine tetra-acetic acid and an alkali metal hydroxide and then separating the hydrocarbons from the aqueous solution. No. 2,474,411. Frederick C. Bersworth.

Photographic

Fog inhibitor silver halide photographic emulsions containing a compound having the structure RuX_5 where X is a halogen atom. No. 2,472,626. William F. Smith and Adrian P. H. Trivelli (to Eastman Kodak Co.).

Fog inhibitor for photographic silver halide emulsions containing palladium nitrate. No. 2,472,627. William F. Smith and Robert E. Stauffer (to Eastman Kodak Co.).

Silver halide emulsion containing an anionic palladium complex salt selected from the group consisting of alkali metal and alkaline earth metal thiocyanato palladites, alkali metal and alkaline earth metal nitritopalladites, alkali metal and alkaline earth metal bromo-nitritopalladates and ammonium nitritopalladite. No. 2,472,631. Robert E. Stauffer and William F. Smith (to Eastman Kodak Co.).

1-naphthol-2-carboxylic acid amide couplers for color photography. No. 2,474,293. Arnold Weissberger, Ilmari F. Salminen and Paul W. Vittum (to Eastman Kodak Co.).

Diazotype sensitized papers having cellulose ether sizing. No. 2,474,700. Sam Charles Slifkin (to General Aniline & Film Corp.).

Polymers

Carrying out a condensation reaction between (a) a substance containing a group which is a member of the series consisting of methylene (CH_2) and methine (CH) groups directly linked to an unsaturated carbon atom including a carbon atom forming part of an aromatic nucleus on the one hand and (b) a substance which is a member of the series consisting of α, β-unsaturated aldehydes, α, β-unsaturated ketones and esters of α, β-unsaturated carboxylic acids. No. 2,472,135 Charles Weizmann (to Polymerisable Products Ltd.).

In polymerization of aliphatic conjugated diolefins in an aqueous dispersion containing an emulsifying agent, the improvement which comprises carrying out the polymerization reaction in the presence of a minor proportion of a glycol mono-ether as a polymerization promoter. No. 2,472,232. Walter A. Schulze and Willie W. Crouch (to Phillips Petroleum Co.).

Fast-setting compound of resin and powered metal comprising phenolic resin, asbestos filler, graphite, and powered metal alloy and a lubricant. No. 2,472,247. Edwin J. Coleman (to Crane Packing Co.).

Condensation product of a polyhalogenated aliphatic hydrocarbon and a copolymer of a polymerizable cyclic compound and an unsaturated aliphatic hydrocarbon. No. 2,472,495. William J. Sparks and David W. Young (to Standard Oil Development Co.).

Polymerizing an alpha alkyl styrene by contacting with a Friedel-Crafts catalyst in the presence of a solvent comprising an inert polyalkylpolysiloxane. No. 2,472,589. Arthur B. Hersberger (to Atlantic Refg. Co.).

Preparing resinous interpolymers by heating an interpolymerizing temperature monomeric dimethallyl maleate, a monomeric diester resulting from the esterification of methallyl alcohol with a dibasic acid selected from the group consisting of succinic, adipic, sebacic and azelaic acids and their methallyloxy derivations, and monomeric styrene. No. 2,472,661. Reynold E. Holmen (to E. I. du Pont de Nemours & Co.).

Vinyl sulfone-diene interpolymers. No. 2,472,672. Charles J. Mighton (to E. I. du Pont de Nemours & Co.).

Polymers of alpha-fluoromethyl acrylic acid esters. No. 2,472,811. Joseph B. Dickey (to Eastman Kodak Co.).

Vinyl chloride resins plasticized with diester-amides. No. 2,472,900. Franklin Johnston and William H. Hensley (to Carbide & Carbon Chemicals Corp.).

Polymerizing a vinyl halide in the presence of an aqueous inert ionizing solvent and a small amount of an acidic complex polymerization catalyst containing a metal salt containing as the positive ion a metal selected from the class consisting of chromium and aluminum, and a peroxide. No. 2,473,005. Joseph W. Britton and Robert C. Dosser (to Dow Chemical Co.).

Composition comprising a copolymer of vinyl chloride-vinyl acetate and ground peanut hulls. No. 2,473,030. H. M. Kulman (to Kulastic Co., Inc.).

Production of a polymer of a beta, gamma-monoolefinic monohydric alcohol having the carbon atom of a terminal methylene group as one of the olefinic carbon atoms, by heating and reacting a carboxylic acid ester of said polymeric alcohol with a monohydric alcohol. No. 2,473,124. David E. Adelson and Theodore W. Evans (to Shell Development Co.).

Preparing a fusible thermosetting resin of improved water-solubility which is capable of serving as an air-drying, tackfree adhesive by condensing formaldehyde and phenol in an acid aqueous solution. No. 2,473,145. Robert C. Hesselbart (to Libbey-Owens-Ford Glass Co.).

Alkylated melamine-formaldehyde liquid compositions. No. 2,473,463. Pierrepont Adams (to American Cyanamid Co.).

Water-soluble stilbene triazine condensation products. No. 2,473,475. Ernst Keller and Reinhard Zweidler (to J. R. Geigy A. G.).

Heating a polyamine having a hydrogen atom attached to an amino nitrogen atom, acrylonitrile, and an ammonocarbonic acid selected from the group consisting of cyanamide, dicyandiamide, guanidine, mono- and asymmetric di-hydrocarbon substituted guanidines, salts of guanidine and said substituted guanidines, biguanide, mono- and asymmetric dihydrocarbon substituted biguanides, and guanyl urea. No. 2,473,498. James R. Dudley (to American Cyanamid Co.).

Heating styrene and butadiene in a closed vessel to produce a viscous liquid interpolymer. No. 2,473,538. Otis R. McIntire (to Dow Chemical Co.).

Polyalkyl-cyclohexanol acrylates. No. 2,473,544. Chessie E. Rehberg and Charles H. Fisher (to U.S.A. by the Secretary of Agriculture).

Polymerizing a monomeric vinylidene compound in an aqueous medium comprising silver ammonia complex ion and a peroxygen compound and in the absence of substantial amounts of gaseous oxygen. No. 2,473,548. Grant W. Smith (to B. F. Goodrich Co.).

Polymerizing a vinylidene compound in an aqueous medium comprising a compound ionizable to yield silver ion, a compound ionizable to yield oxalate ion and a peroxygen compound, and in the absence of substantial amounts of gaseous oxygen. No. 2,473,549. Grant W. Smith (to B. F. Goodrich Co.).

Compounding rosin, rosin oil and polyisobutylene by heating rosin and rosin oil to a uniform mixture, cooling until it assumes a viscously liquid state, and working polyisobutylene into the viscous liquid. No. 2,473,606. Henry N. Padowicz (to Western Electric Co., Inc.).

In polymerizing styrene to a product free from crazing on long standing, the steps which comprise incorporating in styrene, the sodium salt of dioctyl sulfosuccinate and heating the resulting mixture. No. 2,473,708. Ralph F. Hayes (to Monsanto Chemical Co.).

Stable emulsion of water and synthetic resin which includes, as a non-ionic emulsifying agent, an ester of a dicarboxylic acid of the alicyclic series obtained by the heat dimerization of poly-unsaturated long chain fatty acids with a polymerization product of an alkylene oxide of 2 to 3 carbon atoms. No. 2,473,798. Roy H. Kienle and Gordon P. Whitcomb (to American Cyanamid Co.).

Aqueous emulsion containing a homogeneous mixture including a polymerizably reactive monomeric polyallyl ester of a polybasic acid having no conjugated carbon-to-carbon double bonds, and a maleic polyester of hexaethylene glycol. No. 2,473,801. Edward L. Kropa (to American Cyanamid Co.).

Fractionation of linear polyamides with phenol and water. No. 2,473,920. Guy B. Taylor (to E. I. du Pont de Nemours & Co.).

Obtaining synthetic linear polyamides in which crystallization is retarded, comprising blending the molten polyamide with a sulfonated compound of the formula $RCOXR'SO_3M$, wherein R is an open chain monovalent hydrocarbon radical having from 11 to 19 carbon atoms, R' is a divalent saturated aliphatic hydrocarbon radical having from 1 to 6 carbon atoms, M is a metal selected from the group consisting of sodium and potassium, and X is an element selected from the group consisting of oxygen and tertiary nitrogen said nitrogen having a substituent selected from the group consisting of methyl and ethyl groups. No. 2,473,924. Isaac F. Walker (to E. I. du Pont de Nemours & Co.).

Batch process for polymerizing a vinyl polymerizable compound in aqueous emulsion containing, as a catalyst, hydrogen peroxide and a water-soluble iron salt. No. 2,473,929. Wilfred K. Wilson (to Shawinigan Resins Corp.).

1,3-dioxolane polymers. No. 2,473,994. William F. Gresham (to E. I. du Pont de Nemours & Co.).

Polymers from ethylene and branched chain vinyl estrs. No. 2,473,996. William E. Hanford, John R. Roland and Walter E. Mochel (to E. I. du Pont de Nemours & Co.).

Production of a ketal by mixing, in the presence of an acid catalyst, a vinyl alcohol-containing polymer and a diketone taken from the group consisting of diacetyl, acetyl acetone, and acetonyl acetone, and heating. No. 2,474,095. William Robert Cornthwaite and Nestor Winston Flodin (to E. I. du Pont de Nemours & Co.).

Carrying out a condensation reaction between a substance containing a reactive group selected from the class consisting of methylene (CH_2) and methine (CH), said reactive group being in the immediate vicinity of a carbon-containing group containing an unsaturated bond, and a substance which is a member of the group consisting of alkyl halides, alkenyl halides and aralkyl halides. No. 2,474,175. Charles Weizmann (to Polymerisable Products Ltd.).

A resin comprising a conioint polymerization product of an olefin hydrocarbon and sulfur dioxide plasticized with the ester of cresol and benzyl sulfonic acid. No. 2,474,350. George E. Eilerman (to Pittsburgh Plate Glass Co.).

Polymerization process for isobutylene comprising cooling, adding Friedel-Crafts polymerization catalyst and thereafter chemically destroying the catalyst activity during the peak of the polymerization reaction. No. 2,474,571. Paul W. Brakeley, Jr. and David W. Young (to Standard Oil Development Co.).

Polymerization of isobutylene with a diolefin. No. 2,474,592. Frederick A. Palmer (to Standard Oil Development Co.).

Copolymers of vinyl iso-coumarans with ethylenically unsaturated compounds. No. 2,474,612. Arthur L. Barney (to E. I. duPont de Nemours & Co.).

Copolymers of vinyl isocoumarans with styrenes. No. 2,474,613. Arthur L. Barney (to E. I. du Pont de Nemours & Co.).

Copolymers of vinyl isocoumarans with 1,3-dienes. No. 2,474,614. Arthur L. Barney (to E. I. du Pont de Nemours & Co.).

Polymerizing propylene by contacting a propylene-cycloparaffin solution with a solution of $AlCl_3$ in an alkyl halide containing not more than 3 carbon atoms. No. 2,474,670. Arthur B. Hersberger and Randall G. Heiligmann (to Atlantic Refining Co.).

In producing polymers from olefinic hydrocarbons containing at least 4 carbon atoms polymerizable by a Friedel-Crafts catalyst, the improvement which comprises providing an intimate mixture of finely divided solid particles of said olefinic hydrocarbon, Friedel-Crafts catalyst, and an inert solvent, and thereafter causing melting of a small portion of said mixture, the ensuing reaction being characterized in that the heat of reaction is substantially counterbalanced by the heat of fusion of the reaction mixture. No. 2,474,671. Arthur B. Hersberger (to Atlantic Refining Co.).

Copolymer of allyl diglycolyl allyl glycolate and methyl methacrylate. No. 2,474,686. Harry T. Neher, Edwin H. Kroeker and Willard J. Croxall (to Rohm & Haas Co.).

Hexanebisdibutylamide as plasticizer for butadiene-acrylonitrile copolymer. No. 2,474,776. Arthur W. Campbell (to Commercial Solvents Corp.).

Processes & Methods

Carburetor process for acetylene reactions. No. 2,472,084. Hans Beller, and Robert E. Christ and Fritz Wuerth (to General Aniline & Film Corp.).

Carburetor process for acetylene reactions. No. 2,472,086. Hans Beller Robert E. Christ and Fritz Wuerth (to General Aniline & Film Corp.).

Process for separating hydrocarbons by adsorption. No. 2,472,250. Alfred E. Hirschler (to Sun Oil Co.).

Recovery of light-oil vapors from coke-oven gas by an absorbent oil. No. 2,472,810. Fred Denig (to Koppers Co., Inc.).

Rubber

Preparing rubber-like emulsion polymerizates by emulsifying butadiene-1,3 and acrlonitrile in the presence of an alkali soap of a fatty acid, an oxygen-liberating polymerization catalyst and an aliphatic mercapton polymerization modifier containing from 6 to 16 carbon atoms, and adding cyanide ion in the form of potassium cyanide. No. 2,473,390. Harold J. Rose and Marian Kabler Rowan (to Standard Oil Development Co.).

Plasticized elastomer compositions containing n-(hydroxyalkyl)-amides and their fatty acid esters. No. 2,474,793. Philip F. Tryon (to Commercial Solvents Corp.).

Specialties

Rust-inhibiting composition, consisting of the reaction product obtained by heating a heat-bodied glyceride oil and an acid alkyl phosphate, dissolved in a volatile solvent. No. 2,472,099. Loy S. Engle and Walter Fikar (to Interchemical Corp.).

Flameproof coating composition comprising a chlorinated material from the group consisting of chlorinated paraffin wax and chlorinated rubber; and an N-chloro compound. No. 2,472,112. Martin Leatherman (U. S. Army).

Stabilization of butter with tetrachloro-para-benzoquinone. No. 2,472,119. William S. Mueller (to U.S.A. by the Secretary of War).

Typographic printing ink characterized by its ability to set by the addition of water which comprises pigment dispersed in a vehicle the essential binder of which is a resin comprising the condensation product of a phenol and a compound selected from the class consisting of terpene and terpineols which is soluble in a polyglycol. No. 2,472,125. Charles A. Rietz (to Interchemical Corp.).

Producing electrodes for electric arcs, by forming a paste from a solid carbonaceous matter, an organic silicon compound and an organic volatile solvent; shaping and then subjecting it to a hardening treatment. No. 2,472,171. Marcel Victor Oswald (to Societe Le Carbone Lorraine).

Cleansing, penetrating and corrosion loosening composition consisting of phosphorus trichloride and a liquid petroleum hydrocarbon. No. 2,472,298. Charles A. Jensen.

Method wherein the cellulosic materials used for treatment with the pentaerythritol tetra-orthophosphate have been impregnated with an aqueous polyethyleneimine solution. No. 2,472,335. Andrew McLean and Stanley Frederic Marrian (to Imperial Chemical Industries Ltd.).

Contact electrolyte solution for deferred action type batteries comprising ortho-phosphoric acid, an acid selected from the group consisting of hydrochloric acid and hydrobromic acid, and water. No. 2,472,379. Herbert E. Lawson (to U.S.A. by the Secretary of the Navy).

Protecting metal equipment in oil wells against hydrogen sulfide and brine corrosion by introducing compounds selected from the group consisting of pyridine, quinoline, their methyl derivatives and their mineral acid salts. No. 2,472,400. Donald C. Bond and Michael Savoy (to Pure Oil Co.).

Detergent addition agents for mineral oil lubricants. No. 2,472,517. Troy L. Cantrell and Herschel G. Smith (to Gulf Oil Corp.).

Detergent addition agents for mineral oil lubricants. No. 2,472,518. Troy L. Cantrell and Herschel G. Smith (to Gulf Oil Corp.).

Fire extinguishing powder consisting of a mixture of finely divided sodium bicarbonate and silica aerogel. No. 2,472,539. Robert C. McGlenn (to American-La France-Foamite Corp.).

Detergent addition agents for mineral oil lubricants. No. 2,472,552. Herschel G. Smith, Troy L. Cantrell and John G. Peters (to Gulf Oil Corp.).

Galvanizing flux for continuous strip galvanizing consisting of a mixture of sodium and potassium chlorides, and ammonium chloride. No. 2,473,004. Ernest R. Boller, Lowell D. Eubank and Raymond J. Kepfer (to E. I. du Pont de Nemours & Co.).

Preparing petroleum hydrocarbon oil non-corrosive to copper, by strong sulfuric acid, sludge having been removed, the acid treated oil neutralized, the product of neutralization extracted with an immiscible solvent, and the residual immiscible solvent removed from the oil, and the resulting oil treated with clay, which comprises treating the said oil with an aqueous solution of a normal alkali metal sulfite. No. 2,473,195. Charles A. Cohen (to Standard Oil Development Co.).

Producing a substantially water-repellent structural material possessing substantial rigidity by intimately mixing natural soil containing clay and sand with combined minor proportions of resorcinol, formaldehyde, water and hydrated lime, and aging. No. 2,473,326. John Frederick Thomas Blott (to Shell Development Co.).

Drilling mud containing gelatinized starch and mononethanol ammonium 2-benzothiazyl sulfide. No. 2,473,392. William F. Russell (to R. T. Vanderbilt Co., Inc.).

Reducing the corrosiveness of oil by admixing, prior to distillation, an alkali-metal soap of a water-insoluble organic acid. No. 2,473,431. Charles O. Hoover (to Air Reduction Co., Inc.).

Lubricant comprising a major proportion of a mineral lubricating oil and a small amount, sufficient to inhibit oxidation of a monoselenide containing not more than 14 carbon atoms. No. 2,473,510. George H. Denison, Jr. and Paul C. Condit (to California Research Corp.).

Primary cell comprising a sheet zinc electrode, a sheet depolarizing electrode, a semi-permeable membrane and at least one layer of fibrous material interposed therebetween, and an alkaline electrolyte, said depolarizing electrode comprising a metal backing of a ferrous material and a depolarizing layer bonded thereto comprising a mixture of mercuric oxide, graphite and a binder. No. 2,473,546. Samuel Ruben.

Foaming-type galvanizing flux comprising a fluxing agent, selected from the group consisting of ammonium chloride and zinc ammonium chloride, and an organic compound having from one to two aromatic, carbocyclic, 6-membered rings directly joined to two carbonyl substituent groups. No. 2,473,579. Lowell D. Eubank (to E. I. du Pont de Nemours & Co.).

Foaming-type galvanized flux comprising a fluxing agent, selected from the group consisting of ammonium chloride and zinc ammonium chloride, and an organic compound having an aromatic, carbocyclic, 6-membered ring to which are directly joined from 2 to 3 substituents selected from the group consisting of hydroxy, amine, and amine-substituted phenyl groups. No. 2,473,580. Lowell D. Eubank and Charles J. Krister (to E. I. du Pont de Nemours & Co.).

Improvement in the fermentation of bacteria-containing grain mashes in the presence of a yeast which comprises sterilizing the mash with small amounts of a pentachlorophenol. No. 2,473,630. Antonio Barreto (to Monsanto Chemical Co.).

Composition for cleaning a ferrous metal comprising an aqueous solution containing HCl, an organic nitrogen base selected from the group consisting of pyridine and quinoline. No. 2,474,179. Francis N. Alquist and Charles W. Hopkins (to Dow Chemical Co.).

Imparting to a fruit juice an increased resistance to attack by microorganisms by dissolving a compound selected from the class consisting of dehydroacetic acid and its sodium, potassium, ammonium and calcium salts. No. 2,474,226. Gerald H. Coleman and Paul A. Wolf (to Dow Chemical Co.).

Imparting to foods rich in carbohydrates an increased resistance to attack by microorganisms by adding a compound selected from the class consisting of dehydroacetic acid and its sodium, potassium, ammonium and calcium salts. No. 2,474,227. Gerald H. Coleman and Paul A. Wolf (to Dow Chemical Co.).

Imparting to foods rich in proteins and fats an increased resistance to attack by microorganisms by adding a compound selected from the class consisting of dehydroacetic acid and its sodium, potassium, ammonium, and calcium salts. No. 2,474,228. Gerald H. Coleman and Paul A. Wolf (to Dow Chemical Co.).

Imparting to light alcoholic beverages an increased resistance to attack by microorganisms by dissolving a compound selected from the class consisting of dehydroacetic acid and its sodium, potassium and ammonium salts. No. 2,474,229. Gerald H. Coleman and Paul A. Wolf (to Dow Chemical Co.).

Lubricant composition composed of a single phase homogeneous aqueous solution containing amino amide of halogenated stearic acid and a free amine. No. 2,474,325. Thomas T. Rodgers (to Thomas T. Rodgers, Jr.).

Drilling fluid for preventing the hydrous disintegration of shales comprising clay, water, sodium hydroxide, an alkali metal salt of a weak inorganic acid, and sodium chloride. No. 2,474,329. Richard A. Salathiel (to Standard Oil Development Co.).

Drilling fluid for preventing the hydrous disintegration of shales comprising clay, water, sodium hydroxide, an alkali metal salt of an organic acid having at least two carbon atoms and not more than four carbon atoms, and sodium chloride. No. 2,474,330. Richard A. Salathiel (to Standard Oil Development Co.).

Inhibition of corrosion in wells by introducing a corrosion inhibiting amount of butyl mercaptan into the corrosive liquid. No. 2,474,603. Prentiss S. Viles and Elza Q. Camp (to Standard Oil Development Co.).

Rust-preventing compounds consisting of a mineral oil containing an alkyl thioether of a C_3 to C_4 saturated fatty acid wherein the etherifying radical is attached to a carbon atom outside the carboxy 1 group in said acid, said alkyl radical containing 10 to 24 carbon atoms and a C_{12} to C_{30} fatty acid ester of a polyhydric alcohol having from 12 to 80 carbon atoms. No. 2,474,604. Jones I. Wasson and John C. Zimmer (to Standard Oil Development Co.).

In making a vitreous enamel, milling a zirconium type frit comprising SiO_2, ZrO_2, B_2O_3, Al_2O_3 and F_2, together with alpha alumina. No. 2,474,636. Henry Oesterle and Robert A. Oesterle.

Heat treating parts of stainless steel having surface scale, fluxes, oxides, paint or the like to clean and anneal the same and produce a non-oxide bright finish thereon, comprising: heating in a No. 1 liquid salt bath of barium chloride, potassium chloride, barium fluoride, and calcium fluoride; transferring the parts from the No. 1 bath to a No. 2 bath of sodium hydroxide, potassium hydroxide, and sodium cyanide. No. 2,474,674. Artemas F. Holden.

Rectifying a neutral molten salt heat treating bath containing undesirable oxides which includes injecting in a gaseous state into the bath while it is in a heat treating pot a methyl halide of the halide group consisting of chlorine, fluorine, bromine. No. 2,474,680. Paul H. Kramer (to Park Chemical Co.).

Rendering materials water-repellent by contacting with the vapor of monomethyldiethoxysilane. No. 2,474,704. Mary Elizabeth Thayer (to Dow Corning Corp.).

Textiles

Dry spinning vinyl compounds. No. 2,472,842. Antoine Francisque Gaston Mouchiroud and Joseph Aime Trillat (to Societe "Rhodiaceta").

Water, Sewage, etc.

Softening water by introducing PO_4 ions into solution in the water, adding sufficient chemicals from the group consisting of lime and soda to react with the calcium and magnesium hardness in said water, and then flowing said water upwardly through a mass of particles at a rate of flow high enough to maintain said mass in suspension whereby PO_4 ions increases the amount of calcium carbonate which crystallizes on said particles. No. 2,472,616. William George Prescott, Ewart Ingham Akerayd and Eric Leighton Holmes (to Permutit Co.).

*Agricultural**

Fungicidal composition comprising an aqueous suspension of a 4a,5,8,8a-tetrahydronaphthalenedione-1,4. No. 2,475,288. Elbert C. Ladd (to U. S. Rubber Co.).

Protecting materials from insects, fungi and bacteria by applying a pest control composition containing an alkyl ester of a member of the group consisting of aconitic acid, its homologues and its isomers. No. 2,475,629. Edmund R. Meincke (to American Cyanamid Co.).

Fungus-proofing composition for the treatment of cellulosic substances comprising a water-in-oil emulsion having an oil phase comprising a water-insoluble fungicidal agent selected from the group consisting of water-insoluble salts of 8-hydroxyquinoline and of pentachlorophenol, an oil-modified alkyd resin made from a polyhydroxy alcohol, phthalic anhydride and a modifying substance selected from the group consisting of fatty oils and fatty acids, said resin being soluble in mineral spirits, a chlorinated diphenyl mixture, and mineral spirits. No. 2,476,235. Paul George Benignus (to Monsanto Chemical Co.).

Insecticidal and fungicidal agent comprising a nicotine complex salt. No. 2,476,514. Claude R. Smith (to U. S. A. by Secretary of Agriculture).

*Cellulose**

Production of cellulose triacetate from hydrolyzed cellulose acetate, by dissolving a hydrolyzed cellulose acetate in glacial acetic acid, adding acetic anhydride to form the desired tri-acetate, heating and maintaining said mixture at the esterifying temperature for 48 hours. No. 2,475,678. R. D. Rowley (to Celanese Corp. of America).

Stable cellulose ester plastic composition consisting of cellulose ester of fatty acids of 2-4 carbon atoms, a saturated plasticizer, and an unsaturated aliphatic compound containing only C, H, and O and having a carbon to carbon double bond therein. No. 2,475,953. William M. Gearhart and Thomas S. Gardner (to Eastman Kodak Co.).

Making methyl carboxymethyl cellulose with a carboxyalkylating agent in sodium hydroxide and methylating with methyl chloride. No. 2,476,331. Richard W. Swinehart, Albert B. Savage and William D. Kuhlman (to Dow Chem. Co.).

Composition of matter consisting of a cellulosic derivative of the class comprising cellulose esters and cellulose ethers plasticized with triacetate of pentanetriol 1,2,5. No. 2,476,976. Maximilien Grunfeld and Emile Clement Cottet (to Societe des Usines Chimiques Rhone-Poulenc).

Producing a carboxyalkyl ether of a carbohydrate gum selected from the group consisting of galactomannans and glucomannans which comprises dispersing the carbohydrate gum in a solution of an alkali, and then reacting the dispersed carbohydrate gum with an etherifying agent selected from the group consisting of the halo lower fatty acids and salts thereof. No. 2,477,544. Owen A. Moe (to General Mills, Inc.).

*Ceramics**

Ceramic coating for metals which is a fusion product of a frit comprising quartz, feldspar, borax, soda ash, soda niter, fluorspar, cobalt oxide, nickel oxide, and manganese oxide and a mill addition comprising first-

* *U. S. Patents from Vol. 624, Nos. 1, 2, 3, 4.*

grade diaspore, flint clay, soda ash and water. No. 2,475,469. Dwight G. Bennett and Clifford M. Andrews.

Heat resisting coating composition for protecting metals against extended heating and temperatures up to 1600° F. and for suppressing the emission of visibility of infra-red radiation, said coating composition characterized by high resistance to thermal shock and good adherence to the metal comprising a fused enamel frit and a refractory mill addition, the raw frit batch including feldspar, borax, soda ash, soda niter, granular aluminum oxide, sodium silico-fluoride, barium carbonate, zinc oxide, whiting and vanadium oxide, and a mill addition including fused frit, first-grade diaspore and water. No. 2,475,470. Dwight B. Bennett and Clifford M. Andrews.

Coatings

Film-forming composition comprising a copolymer of vinylidene chloride and acrylonitrile dissolved in methyl ethyl ketone containing aromatic hydrocarbon to retard gelatin of the composition. No. 2,474,896. Paul Matthew Hauser (to E. I. du Pont de Nemours & Co.).

Coating composition containing vinylidene chloride acrylonitrile copolymer and a halogenated hydrocarbon as a gel retardant therefor. No. 2,474,897. Paul Matthew Hauser (to E. I. du Pont de Nemours & Co.).

Protecting the surfaces of ferrous metal articles, by cleaning the surfaces and immersing the cleaned articles in an aqueous solution of at least one zinc compound selected from the group which consists (as introduced into said aqueous solution) of zinc oxide, zinc selenite, zinc selenate, zinc phosphate and zinc chromium selenate, at least one selenium compound selected from the group which consists (as introduced into said aqueous solution) of selenium dioxide, selenious acid, the alkali salts, thereof, selenic acid and the alkali salts thereof, and phosphoric acid to dissolve all the zinc compounds present. No. 2,475,944. Charles W. Clark and John H. Schloen (to Canadian Copper Refiners Ltd.).

Trade marks of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

PENA GYM SEALER. Liquid floor sealer. 479,773. Allied Home Prods. Corp.

ANTHRAMINE. Assistants used in dyebaths. 507,289. Arkansas Co., Inc.

COCOON. Resinous plastic solution for temporary protective packaging. 507,473. R. M. Hollingshead Corp.

MELEINE. Plasticized aliphatic triamide with surface tension reducer for inhibiting against fume fading on acetate dyed fabrics. 512,001. Jacques Wolf & Co.

TUFSTUF. Liquid plastic coating material for bowling alleys, approaches and pins. 512,006. TufStuf Products Co.

PHOSPHODUST. Carrier material for pest-control compounds. 512,010. American Agricultural Chemical Co.

SUN-BAR. Prepared paint. 512,011. J. F. Kurfees Paint Co., Inc.

DOZIER & GAY'S. Mixed paints, varnishes, paint enamels, stains, lacquers, roof coatings, floor finishes, automotive finishes, industrial paints, and paints made to specification. 512,012. Dozier & Gay Paint Co.

SUPERJET. Pure carbon pigment of the lampblack type. 512,018. C. K. Williams & Co.

MASON-COTE. Ready-mixed paints. 512,303. Wilbur & Williams Paint Corp.

Howe's. Violin varnish. 512,646. A Schroetter Co.

"THE SUPREME SOILSULPHUR." Agricultural sulphur compound, composed of sulphur, hydrated iron oxide, and inert ingredients. 512,649. Stauffer Chem. Co.

COOL ROOF. Paints for roof coatings. 512,658. Lasting Products Co.

NA-CHURS. Liquid fertilizer. 512,663. Na-Churs Plant Food Co.

Hemolysine. Embalming fluids. 512,929. Williams Chemical Co.

Barrett's MOUSESAULT. Poison for killing mice. 512,957. Barrett Products Co.

RATS' END. Rat killer preparation. 512,961. One-Spot Co.

BUGBLOTTERS. Insecticides. 512,984. Martin Products Co.

KOLORS. Natural or synthetic liquid and paste paints. 517,368. Keeler & Long, Inc.

Sun HORN Crest. Paints. 519,843. Sun Chemical Corp.

KULENE. Refrigerants. 521,386. Eston Chems., Inc.

DA-TEX. Ready mixed oil paint. 521,564. Davis Paint Co.

(Symbol) Wax polishing compositions; oil compositions for penetrating and sealing floors; dressing for oiling and cleaning floors and woodwork. 524,912. Socony-Vacuum Oil Co., Inc.

Free W Rinse. Cleaning compounds. 533,088. Chemical Compounding Co.

Eventone. Ready mixed paints. 533,304. Great Lakes Varnish Wks., Inc.

SWP COVER THE EARTH. Paints (ready mixed, paste or dry form); varnishes; lacquers; stains; enamels; japans; undercoaters; thinners or reducers, vegetable oils, pigments, synthetic resins, dyes, dyestuffs and dry colors. 533,509. Sherwin Williams Co.

Pre-Shrunk. Tung oils. 534,329. O'Brien Corp.

POLYCOTE. Corrosion resistant, asphaltic coatings. 539,960. Kansas City Testing Lab.

fum-i-kill. Moth killing liquid chemical compound. 540,127. Wade, Wenger & Associates, Inc.

ARMSELAC. Shellac substitute. 540,618. Armstrong Paint & Varnish Wks.

KENSERT. Floor tiles composed of asbestos, thermoplastic resins, plasticizers, inert fillers, and pigments. 541,425. David E. Kennedy, Inc.

WOODGLAZE. Mastic compound. 541,608. Tremco Mfg. Co.

KEM LUSTRAL. Paints. 542,055. Sherwin Williams Co.

RE-LIFE-IT. Combination cleaning, polishing, and waxing preparation. 543,274. Disney Products Co.

Style-Tested PAINT COLORS. Paints; varnishes, enamels in the nature of varnishes and paints; lacquers; undercoaters in the nature of varnishes, lacquers, enamels, and paints; thinners for paints, varnishes, enamels, and lacquers; stains; and paint and varnish removers. 543,819. Lowe Bros. Co.

RED SPOT Synrez. Oxide primers and synthetic resinous paints. 545,281. Red Spot Paint & Varnish Co., Inc.

Old English. Paint mixing oils. 545,966. E. I. du Pont de Nemours & Co.

PHILCOTE. Lacquers, enamels, stains, paint thinners, felt flock undercoats, felt flocks, and ready mixed paints. 546,424. Philco Corp.

Probrite. Compositions for use in the plating of metal by electro-deposition. 547,150. Poor & Co.

GRIFFIN. Cleaning materials for fabrics and leather; shoe polishes; shoe blacking; shoe cleansers; leather preservatives; leather dressings; liquid preparation for cleaning and dressing shoes. 547,334. Griffin Mfg. Co., Inc.

GRIFFIN ALLWITE. Liquid, cream, and paste for cleaning and polishing shoes. 547,336. Griffin Mfg. Co., Inc.

GRIFFIN LOTION CREAM. Preparation in liquid, cream, and paste form for cleaning and polishing shoes. 547,337. Griffin Mfg. Co., Inc.

GRIFFIN QUICK CLEANING FLUID. Dry cleaning preparation. 547,339. Griffin Mfg. Co., Inc.

GRIFFIN DYCOTE. Liquid preparation for refinishing and polishing leather shoes. 547,628. Griffin Mfg. Co., Inc.

ROBERTSON. Bituminous and asphaltic paints. 549,003. H. H. Robertson Co.

DOWELL. Chemicals used in the treatment of wells. 549,136. Dowell, Inc.

PRFK. Material of construction of the nature of self-hardening organic resin composition, used as a bonding cement for acid-proof brick or tile. 549,656. Pennsylvania Salt Mfg. Co.

modern methods clean to perfection. Germicide disinfectant, ice box deodorizer, roach and ant powder, powder solvent for clogged drains, and air sweetener. 550,056. Modern Methods, Inc.

(Symbol) Chemical compositions for impregnating and preserving wood; and denatured alcohol. 550,933. Paraffine Companies, Inc.

SILVACON. Comminuted barks of trees for industrial and agricultural uses. 551,421. Weyerhaeuser Timber Co.

FAESY & BESTHOFF, INC. Paradichlorobenzene, calcium chloride compound, chemicals used to acidify soil, chemicals used to preserve eggs, cod liver oil, cesspool solvent, chemical compound containing sodium hydroxide for use as drainpipe cleaner, neutral tri-basic copper sulphate, lime sulphur solution, sodium, arsenite solution, and sulphate of alumina. 551,628. Faesy & Besthoff, Inc.

FEARNCO. House paint. 551,770. Cussins and Fearn Co.

CAL + plus. Fertilizer material. 551,925. Washington Natural Products Co.

INDRABUTAX. Mixture of petroleum wax and resin. 552,976. Industrial Raw Materials Corp.

INDRACERA. Petroleum wax. 552,977. Industrial Raw Materials Corp.

INDRAFINA. Petroleum wax. 552,978. Industrial Raw Materials Corp.

INDRAPOLYWAX. Mixture of petroleum wax and resin. 552,980. Industrial Raw Materials Corp.

KEL-F. High temperature thermoplastic. 552,983. M. W. Kellogg Co.

STRUX. Marine paints. 553,043. C. A. Woolsey Paint & Color Co., Inc.

BELRO. Resin. 553,197. Hercules Powder Co.

Cathedral. Varnish. 553,433. Valentine & Co., Inc.

Three V VVV. Varnish. 553,653. Valentine & Co., Inc.

POLYCO. Nylon in the form of rods and flat strips. 554,153. Polymer Corp.

DITTO. Preparation for blocking out ink writing, or ink spots for use in duplicating processes. 554,868. Ditto, Inc.

". Preparation for blocking out ink writing, or ink spots for use in duplicating processes. 554,869. Ditto, Inc.

ELOXAN. Dyes and dyestuffs. 555,402. Geigy Co., Inc.

ibex. Preparations for the purification and/or treatment of water. 555,417. Ibex Chemical Co.

SOLAD. Synthetic detergent for use in dry cleaning. 555,999. E. F. Drew & Co., Inc.

CARBO. Compressed industrial gases. 556,361. National Cylinder Gas Co.

PANTASTIC. Coating composition comprising a volatile organic solvent and a high molecular weight material suitable for improving the surface of a food container. 557,064. Processed Surfaces, Inc.

CALAR. Soaps, scouring powders, and soap for use in cleansing toilet bowls, urinals, and bathroom fixtures. 557,176. Calar Chemical Co.

Lucas. Insecticides, fungicides, germicides, and horticultural sprays. 557,289. John Lucas & Co.

SUNTONE. Clear, and pigmented resin-base emulsions for use in printing and decorating fabrics. 557,319. Sun Chemical Corp.

MONSANTO. Synthetic resins for use in the manufacture and treatment of textiles. 557,551. Monsanto Chemical Co.

DESMANTHACIDE. Chemical toxicants for use in the manufacture or formulation of herbicides. 557,679. Monsanto Chemical Co.

MANIACIDE. Chemical toxicants for use in the manufacture or formulation of herbicides. 557,680. Monsanto Chemical Co.

FRITILIZER. Finely divided fused admixture of feldspar and phosphate rock. 557,837. Ferro Enamel Corp.

JITTER BUG. Insect repellent. 557,965. Sayman Prods. Co.

NYROGEN. Compressed industrial gas. 558,503. National Cylinder Gas Co.

KITCHEN KLENZER. Cleaning and scouring preparation for household use. 558,880. Fitzpatrick Bros., Inc.

CELLUSORB. Compounded oil used to increase the water absorbing and rewetting properties of paper, cotton, and other cellulose products. 559,254. Socony-Vacuum Oil Co., Inc.

Tadcaster. Soaps and dry cleansing fluids. 559,456. H. E. Shaw Co.

POOFBALL. Preparation for cleaning toilet bowls. 559,708. William Harry Delyn Hornaday, Jr.

Frontier Chemical Company. Caustic soda (Sodium hydroxide) and muriatic (hydrochloric) acid. 560,756. Frontier Chemical Co.

Garcalco. Chemical solvent for the treatment of fuel oil sludge. 561,112. Garratt-Callahan Co.

AFRICANO. Raticides, insecticides, and fungicides. 561,869. Africano Labs.

AIRE•CON. Combined household deodorant and insecticide. 562,063. Hysan Products Co.

Mrs. Lane's. Soap; general cleanser. 562,767. Clover Farm Stores Corp.

ARROWHEAD. Hydrated lime and quicklime. 563,558. U. S. Lime Products Corp.

SIERRA. Hydrated lime and quicklime. 563,559. U. S. Lime Products Corp.

DUODEX. Mildewproofing, mothproofing, insecticidal, and fungicidal composition. 563,868. Nuodex Products Co., Inc.

SEEDOX. Fungicide. 563,976. Sindar Corp.

Prozite. Abrasive bars. 564,897. Poor & Co.

H. Insecticides, disinfectants, and chlordane. 564,945. Julius Hyman & Co.

ANDEROL. Synthetic detergent. 565,467. Lehigh Chemical Prods. Co.

BLUFIXE SOUR. Laundry sour. 565,558. H. Kohnstamm & Co., Inc.

BLUSOUR. Alkali neutralizing compounds used for laundry purposes. 565,564. H. Kohnstamm & Co., Inc.

KWIK K-W WORK. Dry chemical fire extinguishers. 565,707. Kwik Work Fire Appliance Co.

SKELT. Tanning agents. 566,461. E. I. du Pont de Nemours & Co.

Radelle. Soaps. 566,690. Commercial Labs., Inc.

(Symbol) Rhodium solutions and gold cyanide employed for electro-plating purposes. 567,237. Sigmund Cohn Corp.

TOSSIT. Insecticides and larvicides. 568,405. Southern Entomological Co.